METAL FINISHING

REPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

HANSON-VAN WINKLE-MUNNING CO. · MATAWAN, NEW JERSEY, U.S.A. ·

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SEP 1 1943
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Plan

YOUR POST-WAR PLATING PROBLEMS

Now

COPYRIGHT DEPOSIT.

To meet the demands of tomorrow, plans for post war products should be made today.

Backed by 123 years' experience principally devoted to the electroplating industry we now offer our services to help solve the problems of post war plating, polishing and finishing.

Our Experts from Plating Headquarters—Engineering, Development and Research Departments, together with our modern Laboratory—are ready to study your future requirements of design, engineering and production in relation to the finish of your peacetime products; to suggest and outline the latest practices and newest methods; to recommend tested and approved equipment and supplies which will produce best results with greatest economy.

While our manufacturing facilities today are devoted entirely to war production, we will welcome an opportunity to meet with your Post War Planning Committee, discuss your future finishing problems, and present a report covering your individual needs.

HANSON-VAN WINKLE-MUNNING CO. · MATAWAN, NEW JERSEY, U.S.A. · SINCE 1820

Manufacturers of a complete line of electroplating and polishing equipment and supplies

HANSON-VAN WINKLE-MUNNING CO.

MATAWAN, NEW JERSEY

PLANTS: . . Matawan, New Jersey . . Anderson, Indiana . . Bridgeport, Connecticut

SALES OFFICES: Anderson · Bridgeport · Chicago · Cleveland · Dayton · Detroit · Elkhart · Matawan Milwaukee · New Haven · New York · Philadelphia · Pittsburgh · Springfield (Mass.) · Syracuse

3941

OCT - 5 1943

CLEPO 85D

AVIATION CLEANER

The cleaning and rinsing properties of CLEPO 85D Aviation Cleaner have been thoroughly tested in our laboratory using the DuNouy Tensiometer and by preparing luminograms for the photographic method of determining oil residues on metal surfaces.

CLEANING ALUMINUM PRIOR TO ANODIZING AND IN BETWEEN MACHINING OPERATIONS.

●

STRIPPING ZINC CHROMATE PRIMER FROM REJECT PARTS.

●

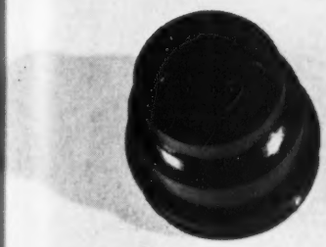
PREPARING MAGNESIUM FOR DOW TREATMENT.

FREDERICK GUMM CHEMICAL COMPANY, Inc.

538-542 FOREST ST., KEARNY, N. J.

War Blackening

FOR ALUMINUM · COPPER · ZINC · STEEL



EBONOL "A" FOR ALUMINUM

A process for the direct blackening of aluminum and its alloys by simple immersion in two solutions. Jet black finishes on aluminum can be obtained in 7 minutes on large objects and small objects treated in bulk. The finish is hard and adherent and does not have to be protected by lacquer.

EBONOL "C" FOR COPPER AND BRASS*

Ebonol "C" is a process for simple, low-temperature, direct blackening of copper and almost all copper alloys. Both dull and shiny black finishes can be obtained. Finish is very adherent and has good wear resistance. Blackening done by immersion in from 3 to 10 minutes at 200 to 215° F.

*PATENT PENDING

EBONOL "S" FOR STEEL AND IRON

Producers of war goods are finding EBONOL "S" to be the IDEAL BLACK. Only one bath is required, and the low temperature (280-290° F) means easier control, less fumes, less drag-out, and lower salt consumption. The finish is ferroferric oxide, which is hard, deep black, and adherent.

EBONOL "Z" FOR ZINC AND ZINC ALLOYS

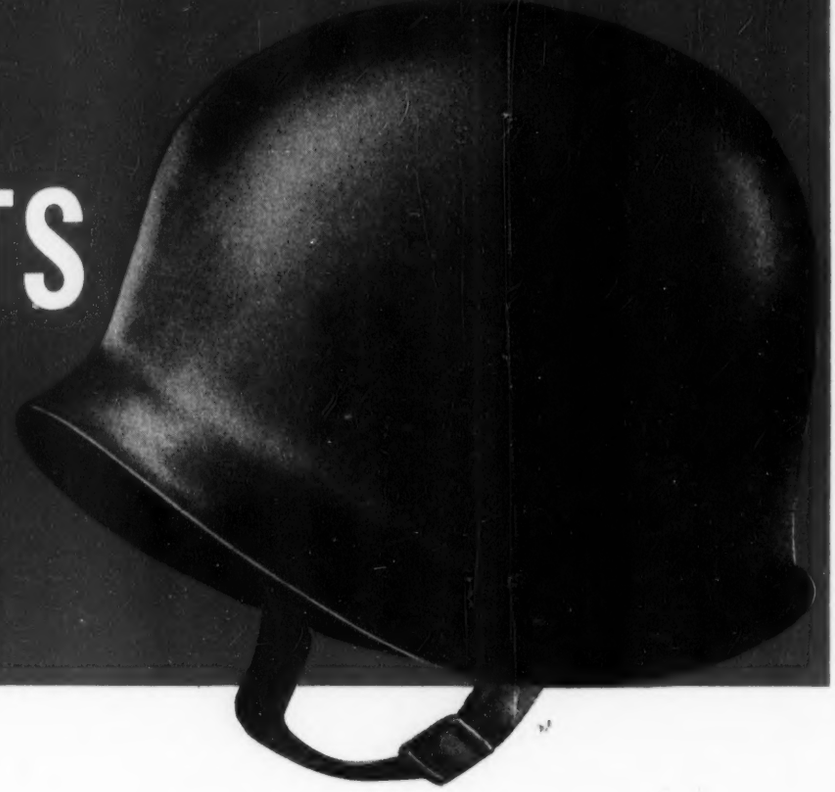
A process for direct blackening of zinc and zinc alloys producing a hard, adherent, beautiful black in from 2 to 7 minutes. Now being widely used in place of plating and enameling, and as an undercoat for lacquers and enamels on zinc plate.

THE

ENTHONE: C O NEW HAVEN CONNECTICUT

REPRESENTATIVES IN PRINCIPAL CITIES

TAKE HELMETS for example:



THE SECRET of increased, smooth-flowing production in many plants making ordnance and other essential war supplies is that they KNOW WHAT degreasing and cleaning materials to use on EACH different metal or alloy in preparing it for final finishing operations.

Aluminum, zinc and similar sensitive metals can be safely cleaned only with materials that do not etch or pit surfaces. Cold rolled and other steels usually require heavy-duty, high-speed cleaning materials, particularly where smut is the primary deposit to be removed. Brass, bronze and copper, due to their susceptibility to tarnish or oxide formation, require still other materials for successful results. And equally important, the METHOD used for cleaning also vitally influences choice of particular material to use on a particular job.

Take Helmets as a Specific Instance . . .

A TANK method for degreasing usually requires one type of material, while an automatic washing machine method necessitates another. But you MUST KNOW WHICH! This example, typical among many on a wide range of war work, illustrates the importance of taking full advantage of Oakite experience ALREADY AVAILABLE . . . of securing the competent, personal help of trained men well-grounded in ALL the basic fundamentals of degreasing both ferrous and non-ferrous metals. Inquiries on your problems invited and promptly answered.

OAKITE PRODUCTS, INC., 18 **Thames Street, NEW YORK, N. Y.**
Technical Service Representatives in All Principal Cities of the United States and Canada

ASK US ABOUT TIME-SAVING OAKITE MATERIALS FOR:

Degreasing steel shells before painting

★

Safely preparing aluminum for anodizing and magnesium for Dow surface treatments

★

Machining fuse bodies and gun parts

★

Cleaning & de-scaling castings before plating, black oxide finishing, etc.

★

Drawing & cleaning brass cartridge parts

★

Rust-proofing torpedo parts between manufacturing operations

★

Cleaning detonator caps before filling

OAKITE CLEANING

MATERIALS . . METHODS . . SERVICE

FOR EVERY CLEANING REQUIREMENT

METAL FINISHING is Published monthly by The Metal Industry Publishing Company, 11 West 42nd Street, New York, N. Y., U. S. A.
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For Greater Economy in

DE-BURRING • BUFFING • GRINDING HONEING and POLISHING

Use ROTO-FINISH

Now . . .

It's the *PROVEN, ECONOMICAL* method of handling the thousands of parts—small or medium—that go into the assembling of airplane engines, machine guns, tanks, and many other tools of war.

After the War . . .

When peace comes, Roto-Finish will prove to be the most practical method of turning out the countless parts used in the manufacture of the many commercial and household appliances that will again go into production.

Write for our illustrated folder and name of our nearest distributor.

HOW ONE PLANT PROFITED . . .

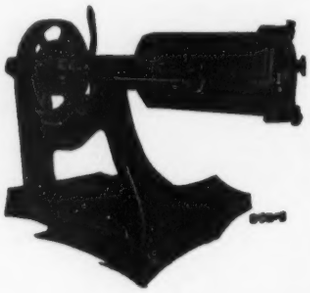
An outstanding illustration of the practicability of Roto-Finish is found in one large defense plant where they installed a battery of machines for de-burring operations on parts for tank motors. After the installation of these machines, they were able to transfer 250 people from hand deburring operations to production machines, where they were urgently needed.

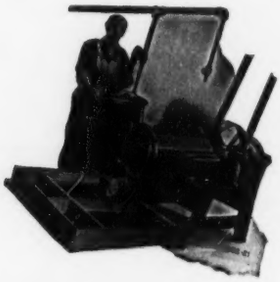
These machines deburred 21 TONS OF MATERIAL IN ONE MONTH—EFFECTING A SAVING OF FROM 200 TO 300 PER CENT OVER HAND METHODS.

INVESTIGATE IT NOW!

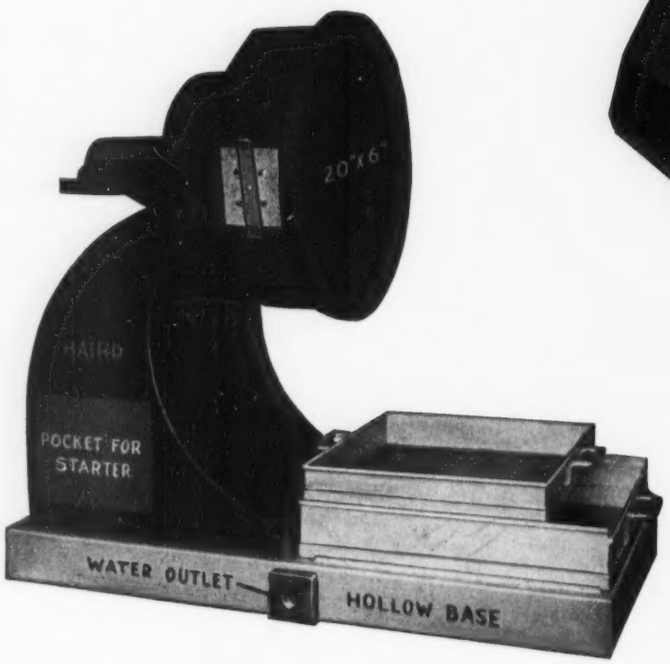
STURGIS PRODUCTS CO.

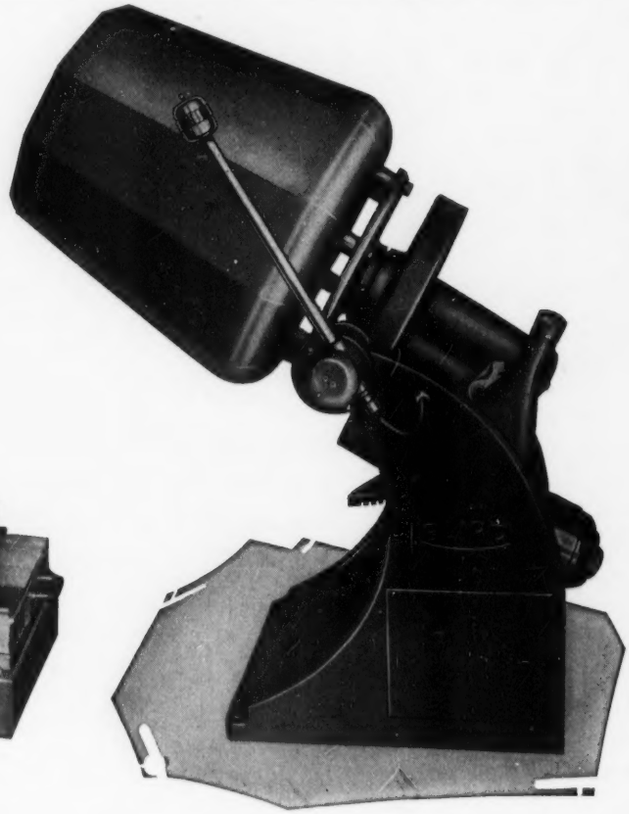
STURGIS • MICHIGAN





HORIZONTAL BARRELS **TILTING BALL BURNISHING BARRELS**





This shows a High and Narrow Type of Barrel mounted on "Baird" Model D. or Pedestal Type Motor driven Oblique Tilting Tumbler.

As shown the barrel was lined for use for burnishing with hardened steel balls.

These barrels may be of any suitable material depending on the job. Cast iron or fabricated steel unlined or lined with rubber etc. for rolling in abrasives.

Made in 20" dia. x 6" for No. 1 Tumbler
Made in 24" dia. x 8" for No. 2 Tumbler

This shows the side of a No. 1 BAIRD Model D. Single Oblique Tilting Tumbler with a No. 22 Sheet Steel Polygonal Barrel and with an Automatic Electrical Tilting Device.

This device AFFORDS GREATEST SAFETY—LEAST LABOR—LEAST FLOOR SPACE—LEAST AMOUNT OF DISTANCE TO MOVE WORK in USING the tumbling barrels. SAVES TIME AND FLOOR SPACE.

When tumbling questions come up "ASK BAIRD ABOUT IT"

AUTOMATIC MACHINERY BAIRD STRATFORD CONNECTICUT, U.S.A.

THE BAIRD MACHINE COMPANY

STRATFORD, CONNECTICUT

Since 1846 specializing in high production machinery for articles of wire and for ribbon metal. Also machines to turn, bore, etc., castings, forgings. etc., up to 10½" diameter.

Wartime Guide to DU PONT ELECTROPLATING PROCESSES

Wartime production has greatly expanded the use of electroplating. Specifications have been revised. Increasing demands are being made on platers for production of finishes on a wide variety of articles for military and ordnance requirements.

Many of the present day needs can be met through the use of one or more of the du Pont processes listed here. A competent group of technical men with many years of experience in all types of plating will be glad to discuss your plating problems and help in the selection and application of appropriate processes. E. I. du Pont de Nemours & Company, (Inc.), Electroplating Division, Wilmington, Del.

"ZINOLYTE." (**Bright Zinc**). Bright deposits directly from baths made up with prepared salts.

"DUROBRITE" (Formerly called **Du Pont Bright Zinc**). For production of bright deposits from solutions made up with standard chemicals.

DUCTILE ZINC. Matt white deposits, suitable for deep drawing and sharp bending.

STRAIGHT CYANIDE ZINC. Easily controlled plating solutions for production of fine grained, rustproof deposits.

SILVER. Heavy coatings . . . adherent and fine-grained, 0.01" or more, can be produced using current densities as high as 50 A./SF.

HALOGEN TIN PROCESS — For high speed plating of strip steel.

STANNATE PROCESS. Practical, economical method for strip steel and general purpose plating.

HIGH SPEED COPPER. For rapid, economical production of heavy, smooth, bright deposits at high current densities.

SULFAMATE LEAD. Easily made up and maintained with prepared salts. Smooth, dense, pore-free coatings from 0.0001" to 0.0025" readily obtained.

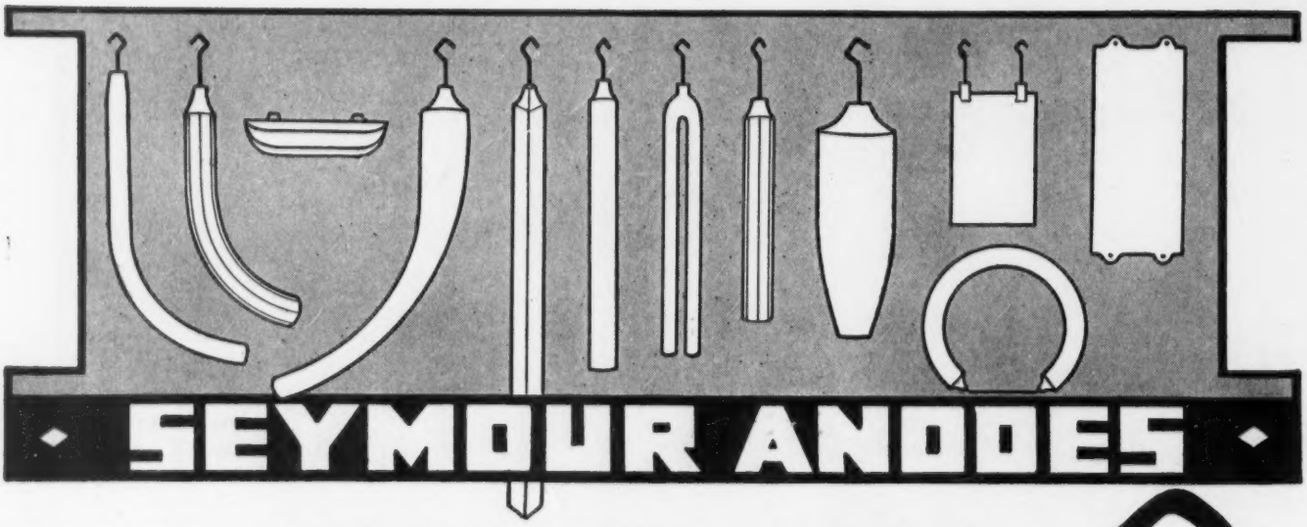
"CADALYTE." Salts and Maintenance Compound for rapid, efficient production of bright cadmium deposits.

STANDARD and SPECIAL CHEMICALS. For Gold, Cadmium, Copper, Chromium, Nickel, Brass, Bronze, Tin, Zinc, Silver, and Lead plating.

DU PONT

ELECTROPLATING PROCESSES and MATERIALS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



SEYMOUR ANODES

For Every Modern Plating Need

NICKEL

99%+ *Rolled Depolarized*—A very fine, homogeneous, even-grained virtually pure nickel anode. Corrodes in hot or cold solutions with minimum metallic loss. Forms practically no sludge. Especially suitable for baths having a pH above 4.5 electrometric.

99%+ *Cast Oxide Depolarized*—Almost entirely pure nickel. Suitable for most cold nickel baths, but especially those having a high pH. Corrodes evenly under most ordinary shop conditions.

99%+ *Cast Carbon*—A pure nickel anode with carbon content adjusted for smooth, uniform corrosion without special controls. Available, however with carbon content to meet any specifications. Adaptable for general run of shop work requiring cold baths.

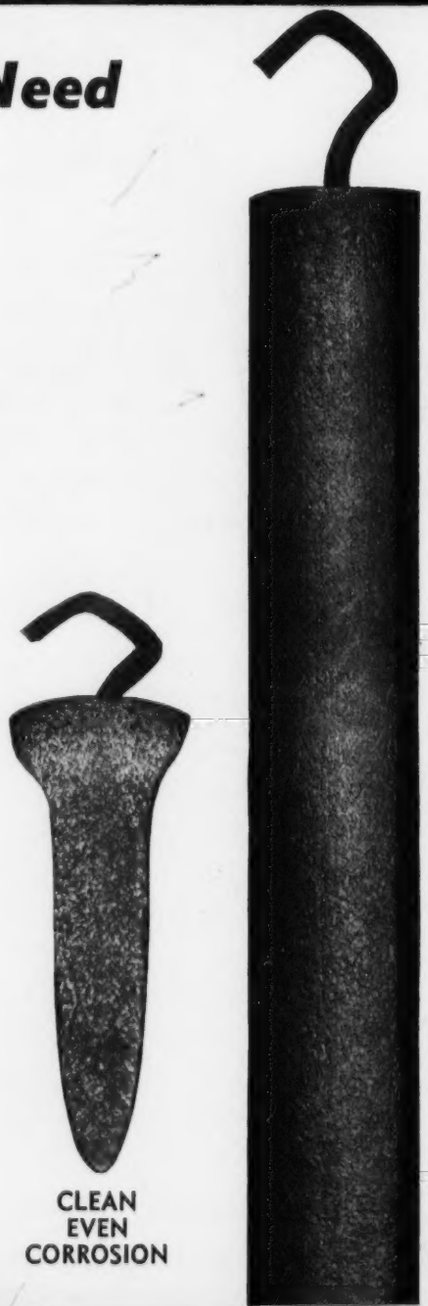
95-97% *Sand Cast*—Corrodes readily in solutions low in nickel or weak in salts—therefore suitable for cold, high pH, low current density plating solutions. Uniform corrosion throughout the life of this anode is obtained by an even distribution of the carbon content. A 90-92% Sand Cast Seymour Nickel Anode is also available.

"Seycast"—An improved type of 99%+ cast anode of very high efficiency designed primarily for Bright Nickel baths, but works perfectly in any hot Watts bath having a pH of 4.5 electrometric or lower. Corrodes evenly with practically no loose nickel formation, due to long, interlocking grains radiating from a common center. Especially suitable for high current densities.

Bright Nickel—A hot organic type process free from promoter metal, stable and easily controlled. Produces brilliant deposits from a standard hot nickel bath without the usual coloring or buffing. Excellent throwing power. Wide operating conditions. Free from wetting out agents.

OTHER ANODES

Seymour Anodes in all shapes to meet rigid specifications are also available in copper, brass, bronze and zinc. The copper used is electrolytic. The zinc is always the best grade obtainable.



CLEAN
EVEN
CORROSION

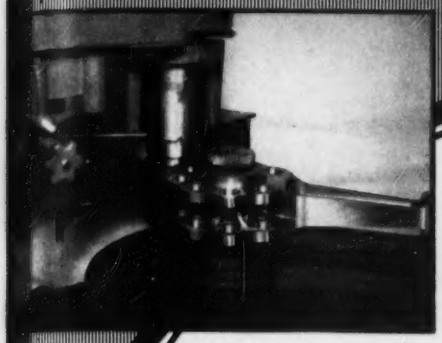
THE SEYMOUR MFG. CO.
70 FRANKLIN ST., SEYMOUR, CONN.

Also Specialists In

NICKEL SILVER & PHOSPHOR BRONZE

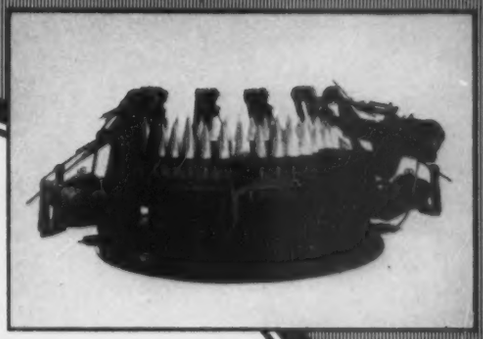
Solving the Man-Power Shortage

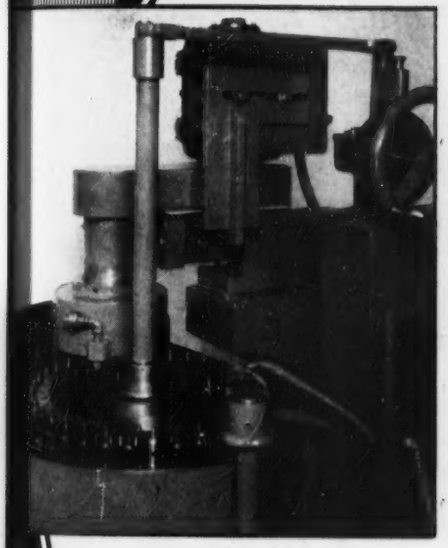
in POLISHING..BUFFING..
WIRE BRUSHING..BURRING



Special Acme Machine for polishing engine parts.

Special Acme Machine with 8 belt heads — for polishing tapered cylindrical parts. Multiplies daily production, with greatly reduced man-power.



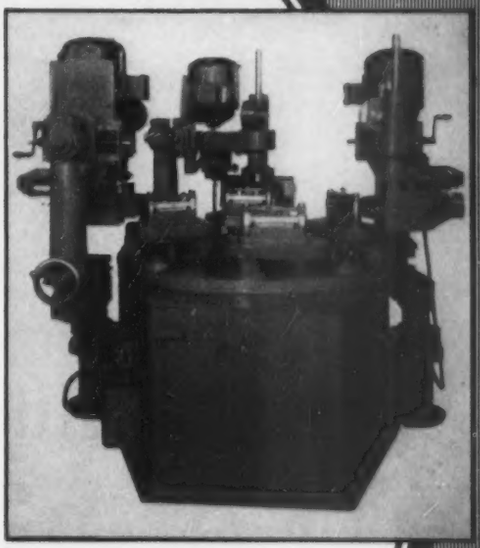


Keep Production Up

BY USING

ACME AUTOMATICS

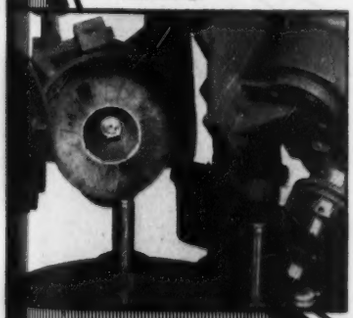
And Spreading Your Man-Power!



Special Acme Machine for grinding small mechanical parts—2000 per hour. Automatic wheel feed. Automatic diamond dresser. Automatic unloading.

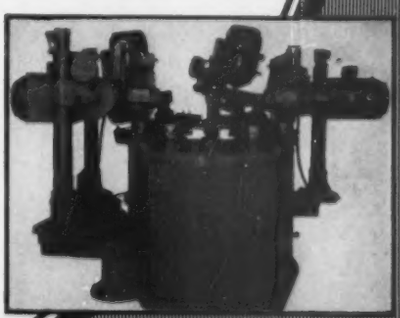
Special Acme Machine for blending the radius in washers—1200 to 1500 operations per hour.

Special Acme Machine for polishing and oiling aircraft parts.



Acme Rotary Machine for polishing, buffing and wire-brushing. Big savings in man hours.

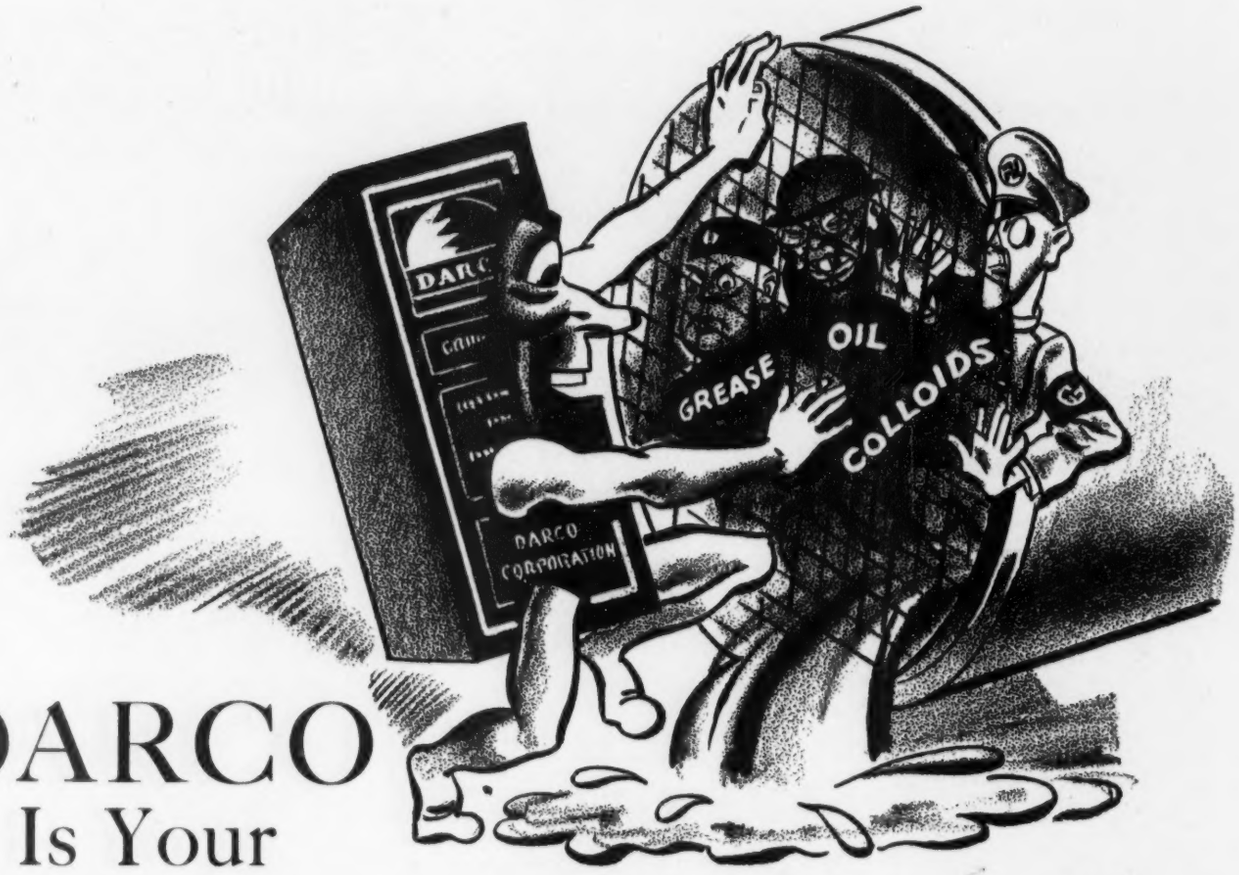
Special Acme Machine for finishing pistons. Constructed to finish valve recess and avoid stuff marks.



ACME Manufacturing Co.

1642 HOWARD ST. • DETROIT, MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS



DARCO Is Your 24-Hour Guard Against Enemy Aliens

Darco activated carbon *continuously* filters out grease, soap, oil, decomposition products and colloidal impurities—*before* they can reach the plating surface.

It is one thing to guard against readily visible suspended matter, with ordinary periodic filtration. But continuous filtration, with Darco S-51, bars even the lurking traces of impurities—removes these ghosts that can ruin good plating jobs.

Important plants are filtering continuously with Darco with trouble-free results —even with today's heavy schedules. With continuous purification they use only small dosages, because impurities are not allowed to build up.

Keep Darco S-51 on guard in your filter. Ten cents buys enough to keep 100 gallons of solution clean for a week.

Be sure to insist on the trademarked package and specify Darco.

The article, "Physical Removal of Impurities from Plating Solutions," discusses continuous filtration in detail. Write for a copy.

DARCO—Reg. U. S. Pat. Off.

DARCO

This trade-mark identifies the genuine. Accept no packages without it.

DARCO CORPORATION

60 East 42nd Street, New York, N. Y.

TO MEET Any DEBURRING or BUFFING Requirement

DEBURRING OPERATIONS

ON STEEL PARTS

On steel parts, on buffs, *Stevens Greaseless Burring Compound* works fast, enables the operator to remove burrs without damaging accurate parts, maintains close tolerances, leaves the work clean and free from grease. Three Grades—Coarse, Medium and Fine.

ON NON-FERROUS PARTS

On non-ferrous parts, *Stevens Tripoli Composition No. 70* works fast, easy to clean, permits accurate work, costs less than Greaseless Compounds.

BUFFING OPERATIONS

ON STEEL PARTS

On steel parts: To remove tool marks, grinding lines, pits, scratches, and other surface imperfections, *Stevens Greaseless Compounds* cut fast, bring up a "satin"-type finish, leave the work clean and free from grease.

As an alternative . . . *Stevens Steel Composition No. 427* works fast, brings up a clear, high finish, leaves parts easy to clean.

ON NON-FERROUS PARTS

On non-ferrous parts: *Stevens No. 70 Tripoli*—also other grades are offered to meet unusual operating requirements of speed, pressures, etc.

ON PLASTICS

On plastics: *Stevens Plasticut* for Buffing, *Stevens Plasticolor* for finishing, and *Stevens No. 16* Black for dark colored plastics, bakelite, etc.

For Tampico Wheels and Brushes—Stevens Tampico Composition adheres to the tampico, insuring fast and accurate work on de-burring or other operations, maintains close tolerances, saves tampico—and is easy to clean.

FREDERIC B. STEVENS, INC.

DETROIT, MICHIGAN

New Haven · Buffalo · Cleveland · Indianapolis · Windsor · Toronto

"EVERYTHING FOR THE POLISHING AND PLATING PLANT"

Pentrate

PHYTANIUM-BLENDED

The MODERN BLACK FINISH for STEEL

Protective penetration—that's Pentrate. Not just a superficial coloring but a durable black finish that penetrates into the surface. ☆ Discriminating manufacturers, anxious to produce the best possible precision instruments, weapons, engine parts, steel propeller blades and many other items, use the patented Pentrate Process.* ☆ Tolerances are maintained with Pentrate, offering protection and friction reduction qualities to bearings and close assemblies.

Send for free copy of the new Pentrate Book

HEATBATH *Corporation*

SPRINGFIELD, MASSACHUSETTS

*PATENTED

A PUMICE TO MEET EVERY NEED

Not until Valencia — the standard of American Pumice— was discovered at Grants, New Mexico, was it thought that a domestic pumice could match the quality of imported Italian Pumice. This inexhaustible deposit at Grants is true pumice stone and not a volcanic ash. It is physically and chemically equal in every respect to the now unobtainable Italian Pumice. • The Valencia plant's output of grades for every need is rigidly under control for particle size, purity, weight and color.

Check this table comparing Valencia with the highest grade of imported Italian Pumice. See for yourself that Valencia is truly the standard of American Pumice.

	American Pulverized Per Cent	Italian Select Per Cent
Silica	72.90	73.24
Alumina	11.28	10.61
Iron Oxide	.86	1.57
Titanium Oxide	.06	.10
Calcium Oxide	.80	1.10
Magnesium Oxide	.36	.40
Soda	3.64	3.03
Potash	4.38	5.58
Sulphuric Anhydride	.03	.05
Loss on ignition	5.20	4.04

Distributors of
THE PUMICE CORPORATION *of* AMERICA
GRANTS NEW MEXICO

WHITTAKER, CLARK & DANIELS, INC.

260 WEST BROADWAY • NEW YORK CITY

Warehouses: Detroit, Michigan and South Kearny, N. J.

DURIRON PRODUCTS
In Anodizing Processes

DURIRON EQUIPMENT USED

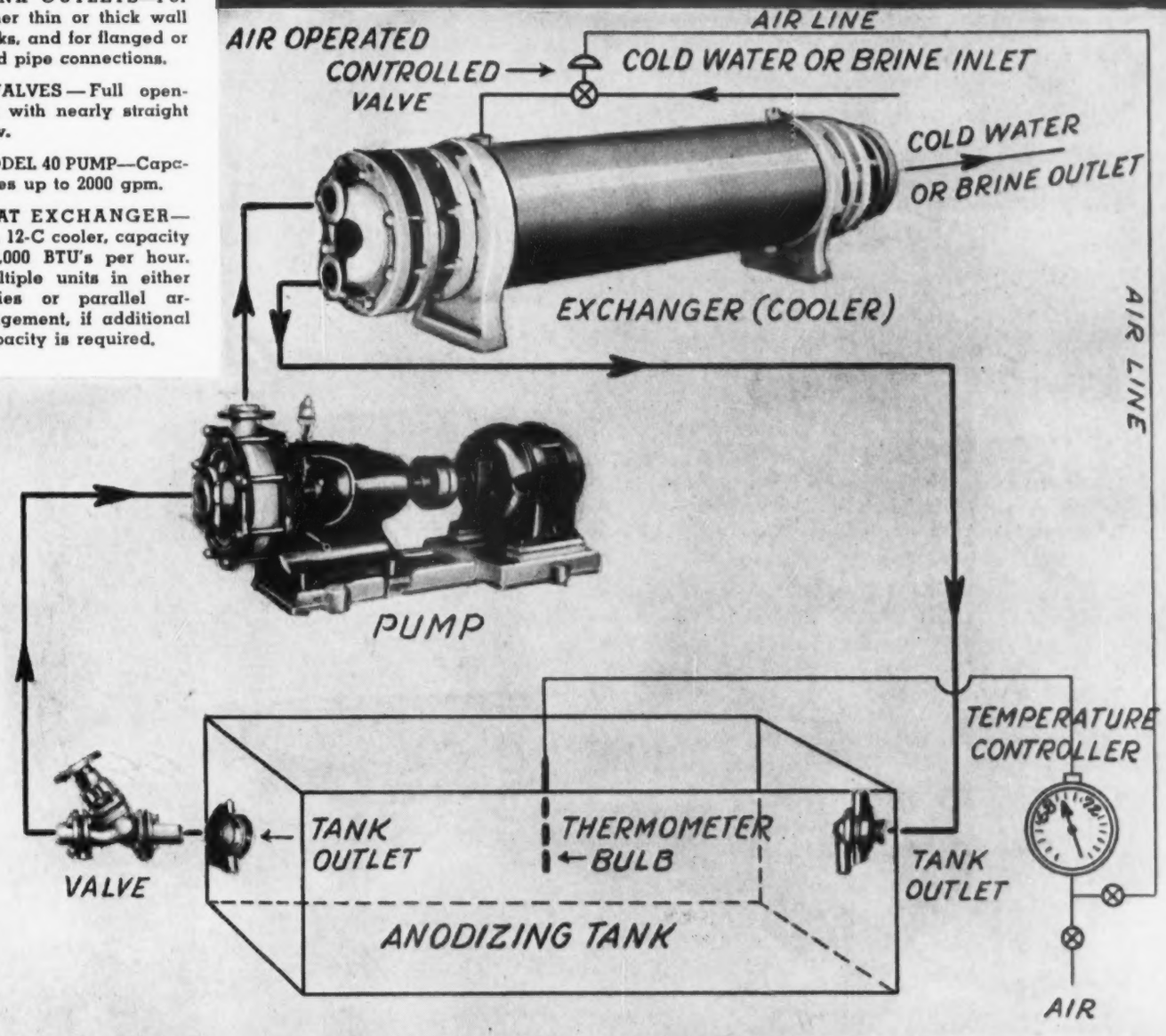
TANK OUTLETS—For either thin or thick wall tanks, and for flanged or lead pipe connections.

Y-VALVES—Full opening with nearly straight flow.

MODEL 40 PUMP—Capacities up to 2000 gpm.

HEAT EXCHANGER—No. 12-C cooler, capacity 300,000 BTU's per hour. Multiple units in either series or parallel arrangement, if additional capacity is required.

A typical flow sheet showing Duriron equipment as used for anodizing aluminum airplane parts.



ARMY E NAVY

DURIRON · DURICHLOR · DURIMET · DURCO STAINLESS STEELS

CORROSION-RESISTING DURCO ALLOYS & EQUIPMENT

THE DURIRON CO., INC. DAYTON OHIO

ADVANTAGES OF DURIRON EQUIPMENT

There are some very definite advantages for the airplane parts manufacturer in the use of Duriron equipment.

1—Alloys are available which are completely resistant to either sulphuric or chromic acid types of anodizing solutions.

2—There is a saving of floor space because the efficiency of the equipment allows use of minimum size cooling units.

3—There is close temperature control, usually within one or two degrees.

4—Equipment for the most part does not require use of controlled or critical materials.

5—Prompt deliveries are assured if you will furnish reasonable preference rating.

THE DURIRON COMPANY, INC. DAYTON, OHIO

NO ABSENTEE AMPS *HERE!*

NO SIR! **Every amp does its duty in electric plating generators and shop motors equipped with the right grade of SPEER brushes. No better brushes made anywhere, no better guide to correct brush applications than SPEER'S forty-five years of commutation engineering.**

For specific advice applied to your own operating conditions write for a set of SPEER Brush Data Forms—one for each machine you wish to improve. We will send them promptly. You fill in, mail to us—and back to you will speed our recommendations. No obligation on your part—this is a war-time service SPEER is glad to perform to help conserve power by better commutation. Write for your Brush Data Forms and say how many you want. Please write on your business stationery.

PROMOTE COPPER SALVAGE

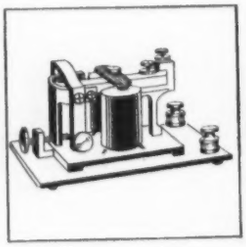
Save the shunts and connections from discarded brushes. This helps to salvage copper needed for war material. Keep it moving to your salvage dealer as fast as it is accumulated.

A FEW OF THE MANY AVAILABLE SPEER BRUSH GRADES
WRITE FOR CATALOGUE SHOWING COMPLETE LINE

Application	*Brushes*				
	E24	E31	E35	688	2685
Welding Generators	+	+			
Induction Motors (slip ring)				+	
Crane and Hoist Motors	+		+		
Synchronous Motors					+
Industrial Motors				+	
Mill Type D.C. Motors			+		
Industrial Generators	+		+		
Rotary Converters		+	+	+	
Single Phase Commutator Motors		+	+		
Polyphase Commutator Motors		+	+		
Characteristic of Brush Grades	**E24**	**E31**	**E35**	**688**	**2685**
Polishing Action	0	0	0	3	2
Carrying Capacity (amps.)	60	70	75	150	65
Contact Drop	VH	VH	VH	VL	L

VH—Very High VL—Very Low L—Low

Famous American Firsts



Magnetic Telegraph 1832

SPEER BRUSHES For the newer interpole platers — SPEER Grade 680. For the older non-interpole machines—SPEER Grade 682. For the very old machines converted from gauze to block brushes — SPEER Grades 688 or 690.
There is one right brush grade for every job—and SPEER makes it.

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Leaders in Industry use

PALLITE
TRADE MARK

PALLADIUM PLATING SOLUTION

PALLITE has been tested and used successfully for more than 11 months by leading manufacturers in many important industries.

PALLITE is quick—flash about 5 seconds;

PALLITE is stable—as stable as any solution of this nature can be;

PALLITE is easy to use—no complicated Voltmeter and Ammeter readings are necessary.

Compare PALLITE with any other solution. Better still, don't take our word for it; let the successful results of firms in *your* industry prove this to you. That's a fair comparison.

For PROVEN results, insist on PALLITE.

PRECIMET LABORATORIES

Division of GEORGE C. LAMBROS

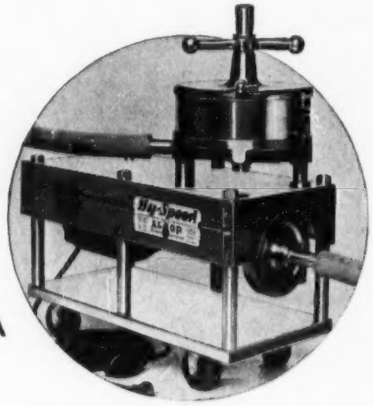
Research & Development Engineers in Precious Metals

64 Fulton Street **New York**

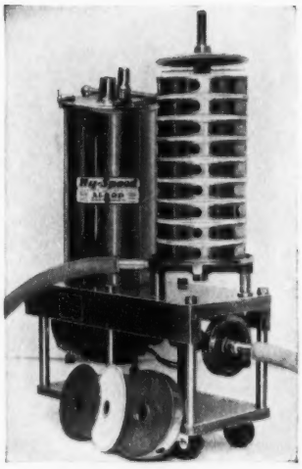
Alsop

Hy-Speed

FILTER EQUIPMENT *for* PLATING SOLUTIONS


A

The above headline is from the cover of the most popular book on the filtration of plating solutions. The benefits to be derived by "Sealed Disc" filtration, an explanation of the most unusual filtration principle used, and illustrated thruout with various types of filters.

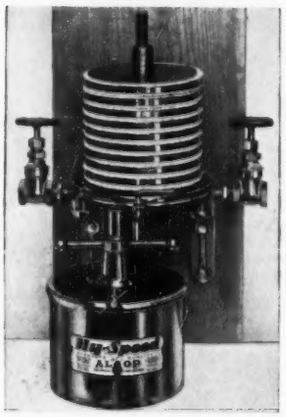

B

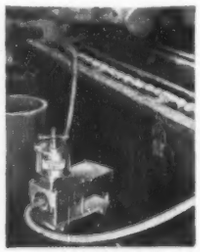
Alsop "*Sealed Disc*" Filters

ARE THE SELECTION OF FAR SIGHTED PLATERS

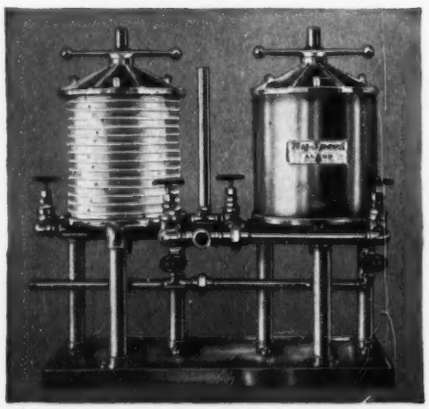
They know that by keeping their solutions perfectly clean of all dirt, dust, and the impurities present in materials used, they will produce finer plated surfaces, cut down rejects, and increase their production.

The illustrations shown at right are a few of the many types made. (A) is a small portable, (B) is a portable of greater filter area and therefore capacity, (C) is a pipe lined connected type for water, oils, etc., (D) is a multiple type filter for large capacity filtration. This can also be furnished in portable type.


C


A "Sealed Disc" Filter in action.

If you would like a copy of our book it will be sent. A postcard will bring it.


D

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America's finest complete service

to the Plating, Polishing and Anodizing Plants

•

Part of Udylite's design and layout department where you may obtain the advice and assistance of experienced metal finishing engineers.

This is the laboratory where all Udylite products are developed and constantly tested under actual plant operating conditions.

UDYLITE has everything for the metal finishing plant. An Engineering Staff with years of practical experience to assist you in laying out your new plant or improving the efficiency of your present one.

Equipment for every need, that has proved its dependability in actual service records.

A very complete list of supplies second to none in quality. If you have a metal finishing requirement or a tough problem bring it to Udylite. Our experienced engineers and electro-chemists are at your service. Your inquiry will be handled promptly and efficiently.

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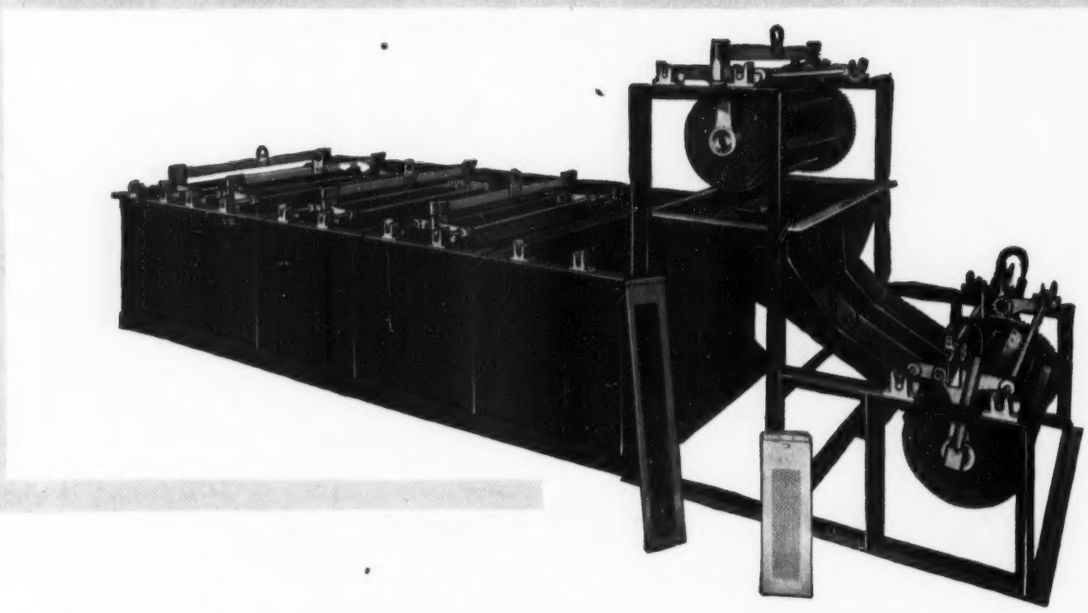
Use LASALCO AUTOMATIC FINISHING ROOM EQUIPMENT



Today's tremendous War production problems demand fast, efficient, dependable plating and finishing room equipment that can be handled with a minimum of manpower. Lasalco Multiple Cylinder Cleaning —Plating—Rinsing Machines can do exactly that for you.

Revolving cleaning cylinders burnish work while cleaning. Transfer of work after thorough rinsing to and from plating cylinders before and after plating is quickly effected with transfer hoppers, eliminates staining, and reduces labor cost. Plating cylinders are exceptionally resistant to corrosion and abrasion.

Call a Lasalco Engineer to help you select the right equipment to do your job. He's a specialist in plating and finishing problems, who can save you time and trouble by doing the job *right* the first time.

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—To Conserve Man Hours

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AD-LEA-SIVE

IN BAR FORM*

A Fitting Companion to

LEA COMPOUND

CONVENIENT • PRACTICAL • ECONOMICAL

You know AD-LEA-SIVE, a special glue-base sizing, and what it can do to promote more economical polishing by:

1 . . . eliminating the necessity of setting up wheelheads with cement or glue and loose abrasives;

2 . . . broadening the use of LEA Compound, making it suitable for many heavy cutting jobs;

3 . . . increasing the use of AD-LEA-SIVE and LEA Compound in the burring and polishing fields;

4 . . . increasing "per application" life of LEA Compound;

5 . . . increasing wheel life;

6 . . . increasing wheel production time;

7 . . . reducing wheel inventories.

NOW —AD-LEA-SIVE—is available in bar form making it more convenient, more practical, more economical to use. Application is direct from bar to wheel. Friction heat does the melting.
Submit your problem to our technical advisers.

**Patent Pending*

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KIRK & BLUM
down draft
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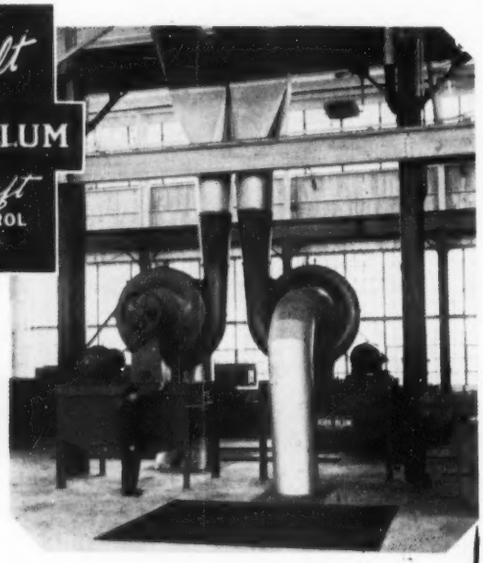

Another Large Planer Plant Increases *SPEED and EFFICIENCY* In Grinding Operations

One of the latest Kirk & Blum installations is that of The G. A. Gray Co., manufacturers of large planers. Here, limited space called for compactness in designing a dust collecting system that would retain all the efficiency so characteristic of Kirk & Blum Systems. Our engineers designed a down-draft system composed of two units, as shown above.

These units, served by American Air Filter Roto Clones, exhaust from three floor, "Down-Draft Stations." System in background is for the express purpose of long planer bed cleaning, and permits men to grind each side of planer simultaneously.

DUST CAPTURED AT ITS SOURCE

The "Down-Draft Station" in foreground handles all odd size castings, such as columns, housings, rails, etc., and is of sufficient size to permit several men to grind. This arrangement saves time and increases production. The metal dust from grinders is captured at its source and drawn into hoppers under the floor, while cleaned air is discharged into outside atmosphere.

Results of this installation are proving the soundness of Kirk & Blum judgment in applying the correct principle to fit the individual job.

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AN ORGANIZATION OF ENGINEERS AND MECHANICS
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AIRLION #81

YES, with the speed of placing a telephone call—TURCO AIRLION #81 answers your aluminum and other metal cleaning problems.

AIRLION #81 is highly recommended by many war production industries to speed up the pre-cleaning and cleaning of metals before anodizing, chromatizing, and phosphatizing.

TURCO AIRLION is potent but safe. The maximum alkalinity content causes rapid action while its chemical combination provides an important safety factor, vital in the handling of metals.

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it's time to use proven

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Today's wartime effort demands maximum service out of your plating insulations. Anything less will, in time, put you behind the proverbial eight ball. Whatever your plating insulation or stop-off needs; hard chrome, indium, silver, high speed copper, iron, etc., Rackote can supply you with the proper plating insulation to meet your specific requirements. Rackote offers you a proven product—insulation that has stood the test and is being used on leading production lines throughout the country. Factory stocks insure prompt delivery. Write for information.

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WIRE DU-LITE!

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It's weightless. It's invisible. It has no formula or properties. But it's precious, just the same.

Call it "know-how"—the valuable by-product accumulated through years of experience. Hundreds of metal cleaning and degreasing problems—in every field from airplanes to tanks, shell cases to machine guns—have sharpened the skill and widened the scope which make up Wyandotte "know-how" today.

There are no priorities on this "by-product." Wyandotte Service Men are prepared to turn this knowledge to your advantage. Backed by a complete line of Wyandotte Metal Cleaning and Degreasing Compounds these men, every day, are cutting cleaning time, cutting rejects, cutting costs. Let them work with you on *your* cleaning job.

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• *Wyandotte Chemicals Corporation consolidates the resources and facilities of Michigan Alkali Company and The J. B. Ford Company to better serve the nation's war and post-war needs.*

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TO JOB PLATERS AND MANUFACTURERS

To relieve present congestion in aluminum anodizing under Specification AN-QQA-696-a approved (Sulphuric Acid Type).

A few exclusive territorial licenses to job platers are still available.

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"Don't Tolerate Dirty Solutions!"

Obtain Sparkling Finishes by using

SPARKLER HORIZONTAL PLATE FILTERS

The QUICK, ECONOMICAL, THOROUGH Method

It is always sound economy to buy the most efficient machine. Nation wide experience has established that the Sparkler Plating Solution Filter is unexcelled in efficiency. Enclosed system filters designed to eliminate leakage, with faster flow rates and longer filtering cycles between cleanings.

LOW COST OPERATION — EASY TO CLEAN
COMPACT & PORTABLE — USE ANY FILTER MEDIA

14 ENGINEERS AT YOUR SERVICE

Write for name and address of your nearest Sparkler filtration engineer. Freely submit your plating solution clarification problems to us for analysis. No charge or obligation for this service.

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Capacities: 50 to 10,000 G.P.H.

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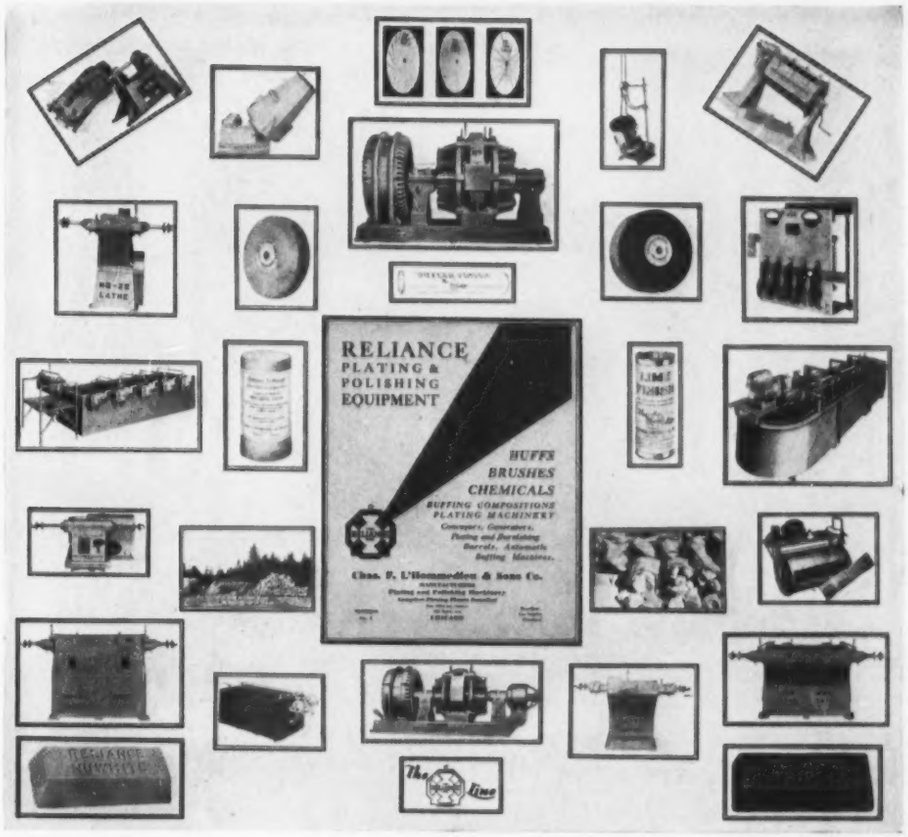
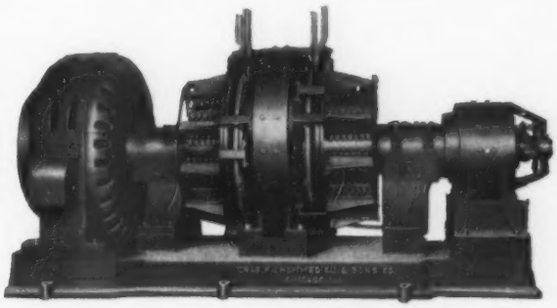


EVERYTHING FOR PLATING AND POLISHING



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Manufacturers of

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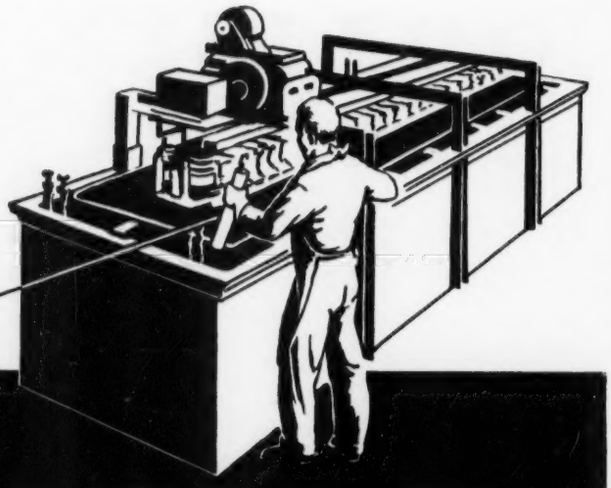
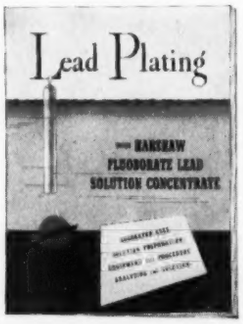


* FOR FIGHTING FINISHES

Harshaw Anodes and Chemicals are PERFORMANCE-PROVED for Wartime Plating

SPECIFICATION changes, unfamiliar plating materials and techniques and unskilled operators all present new problems to electroplaters. Two factors that never need be a problem, however, are the chemicals and anodes you use. But unless they are right, and you *know* they meet rigid specifications, excessive spoilage and needless delays for trouble shooting can result.

When you specify Harshaw plating chemicals and anodes, you can be sure they have been made to conform to the highest standards of the industry. And you can depend on the full cooperation of the company to meet your delivery requirements.



WRITE FOR THIS NEW BOOKLET

It contains factual data on lead plating with Harshaw Fluoborate Lead Solution, the concentrate which makes preparation of lead plating baths simple, fast and economical. This booklet has been written to give platers the usable information they want, and can use.

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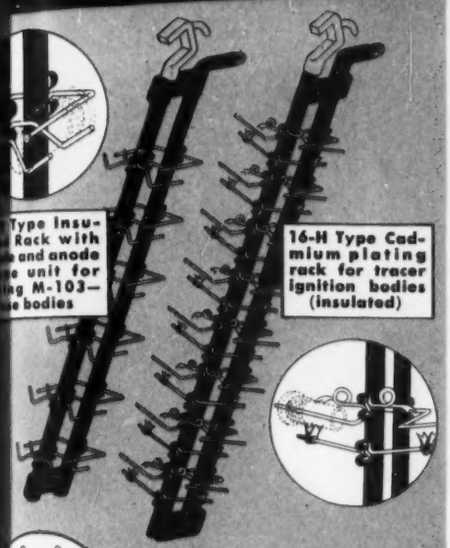
Insist On Genuine

BELKE PLATING RACKS

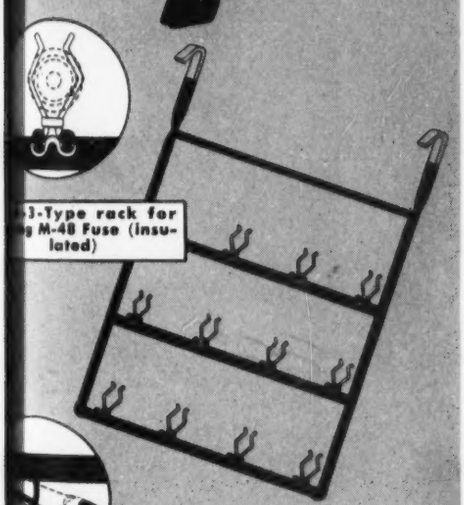
New — Wonderful Synthetic Insulation

FOR ANODIZING

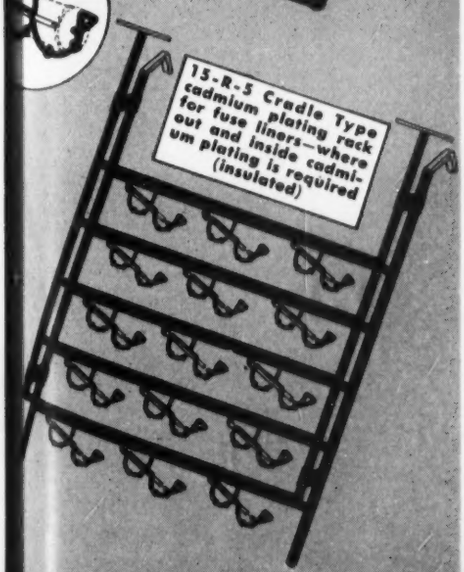


Type Insu- Rack with and anode unit for M-103— bodies

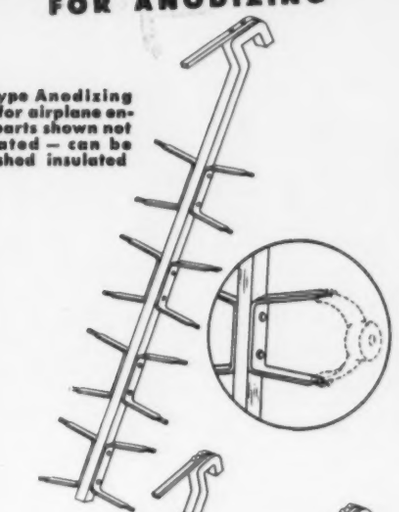
16-H Type Cadmium plating rack for tracer ignition bodies (insulated)



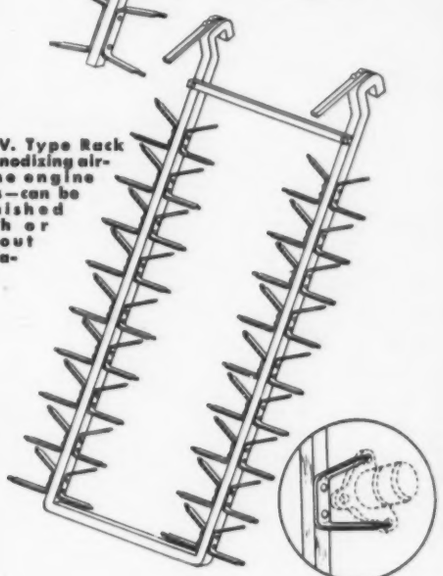
-Type rack for M-48 Fuse (Insulated)



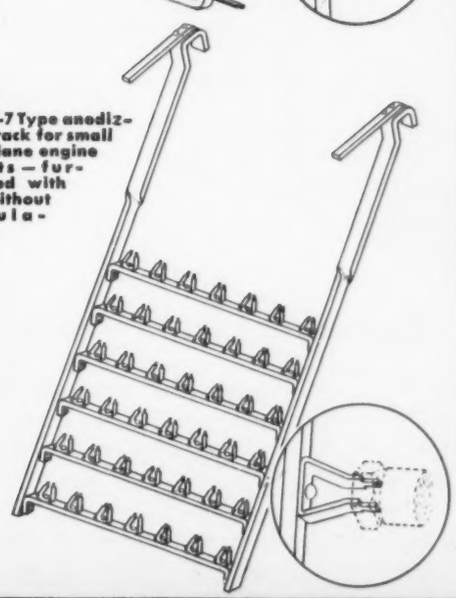
15-R-5 Cradle Type cadmium plating rack for fuse liners—where out and inside cadmium plating is required (insulated)



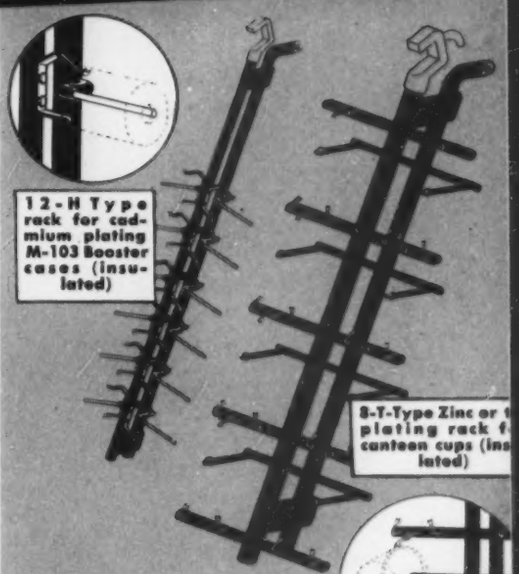
8-H Type Anodizing Rack for airplane engine parts shown not insulated — can be furnished insulated



36-LV. Type Rack for anodizing airplane engine parts—can be furnished with or without insulation

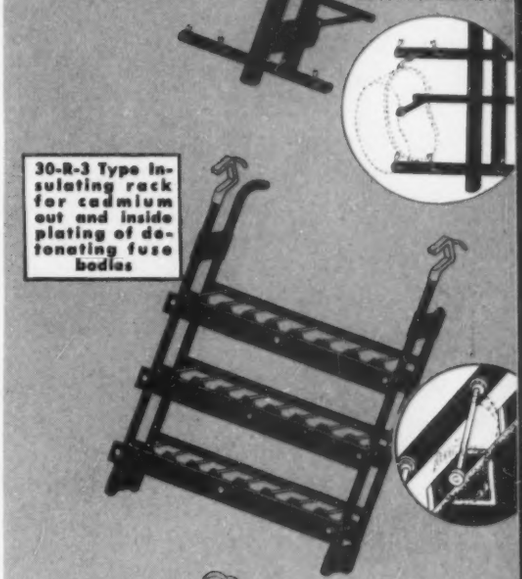


42-R-7 Type anodizing rack for small airplane engine parts — furnished with or without insulation

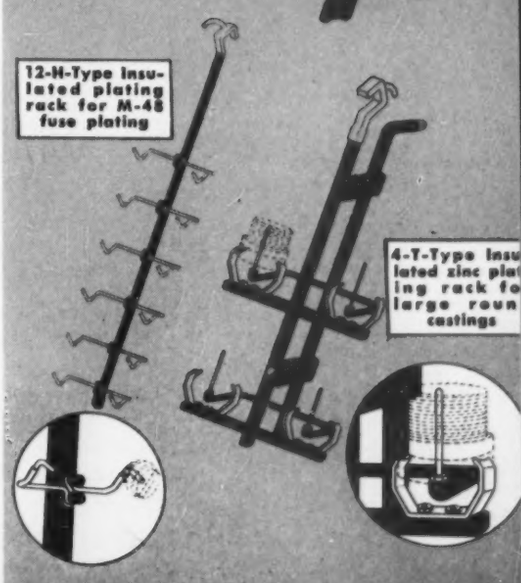


12-H Type rack for cadmium plating M-103 Booster cases (insulated)

8-T-Type Zinc or plating rack f canteen cups (ins lated)



30-R-3 Type insulating rack for cadmium out and inside plating of detonating fuse bodies



12-H-Type insulated plating rack for M-48 fuse plating

4-T-Type Insulated zinc plating rack fo large roun castings

BELKE MANUFACTURING COMPANY

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QUICK FACTS ABOUT *United Chromium*

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These U. C. Processes and Products are *at your Service!*

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UNITED CHROMIUM'S more than 15 years' experience in electrolytic processes has been applied to the very problems that arise in utilizing these finishes for the war effort. Every day we are assisting hundreds of important war contractors on applications that involve the use of such operations as: cleaning and preparation for plating, solution control, plating cycles, racking techniques, stopping-off, stripping and other exacting procedures. Through our engineering facilities and staff of field engineers, United Chromium makes this "know-how" readily available to platers and manufacturers who can utilize it in the production of vital war materials.

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In serving hundreds of licensees, we have had wide experience in how to train platers to the strict operating cycles and plating techniques required for work to precision standards.

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We are prepared to recommend companies who through experience, equipment, personnel and supervisory counsel of U. C. Engineers, are ideally suited to handle your type of work.

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United Chromium has developed many processes, production materials and techniques that save time and avoid waste of valuable metals and solutions.

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The facilities of our chromium plating licensees are enlisted today in the battle against wear and corrosion — making it possible to extend the life of a wide variety of parts and tools — and to reclaim them when worn or machined off-size. We have prepared a helpful booklet, "The Last Thousandth of an Inch", describing these applications in detail. In writing for a copy, please mention Metal Finishing.

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INCORPORATED

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plating racks used in all types of plating and anodizing solutions.

UNICHROME* "QUICK DRY" STOP-OFF LACQUER 322—An adherent, very fast drying lacquer used in cyanide copper, chromium and other plating solutions.

UNICHROME* "QUICK DRY" STOP-OFF LACQUER 323 — A tough, very fast drying lacquer used in chromium and other plating solutions as well as Parkerizing solutions. Can be peeled off after it has served its purpose.

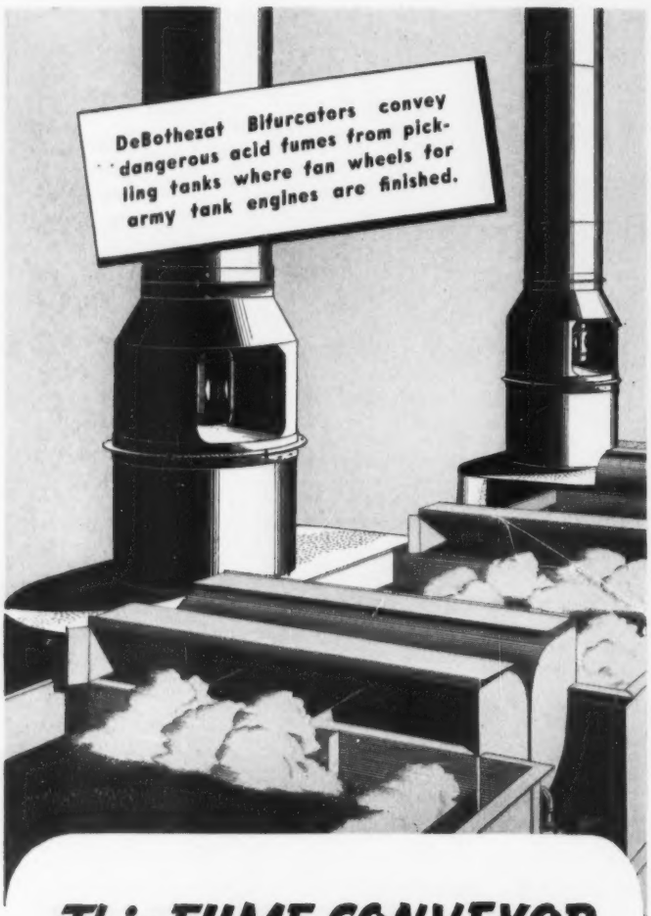
UNICHROME* RESIST LACQUER BG — A chemically resistant lacquer used principally as a stop-off in hard chromium plating and Parkerizing operations. Can be peeled off after it has served its purpose.

UCILON* —An air-drying, corrosion-resisting coating material for protecting metal, wood, concrete and other surfaces against the action of both acids and alkalies, as well as water, gasoline, oil and various corrosive chemicals.

UNICHROME* STOP-OFF COMPOUND 311 — A solid, wax-like formulation which is melted and applied as a hot liquid for stop-off purposes in chromium and other plating operations.

UNICHROME* RESIST SHEET AND ROD — A solid insulating material used in constructing composite plating racks, stop-off shields, and lattices for preventing short circuits in anodizing tanks.

*Trade Mark


DeBothezat Bifurcaters convey dangerous acid fumes from pickling tanks where fan wheels for army tank engines are finished.

This FUME CONVEYOR INSTALLS IN THE DUCT

YOU CAN INSTALL DeBothezat Bifurcators in any position from horizontal to vertical . . . and *right in the duct!* This feature *eliminates* elbows, bends and supporting platforms. Bifurcators are supported like any length of ordinary duct work. Extreme flexibility makes installation simple and inexpensive.

MOTOR ISOLATED FROM FUMES in a through-ventilated chamber. Motor is easily accessible for inspection and servicing.

MOTOR PROTECTED against burning out by non-overloading power characteristic of the DeBothezat Axial-Flow fan.

SIZES of Bifurcators range from 18″ to 48″ in a wide range of capacities.

ARMY E NAVY

Send for Interesting FREE Bifurcator Book ➡

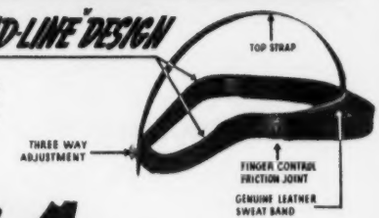
DeBothezat

VENTILATING EQUIPMENT
Division of
AMERICAN MACHINE AND METALS, INC., EAST MOLINE, ILLINOIS

FULL-FACE PROTECTION
against **LIGHT** *flying particles*
WITH A BIG PLUS IN EASY COMFORT!

Featuring the "HEAD-LINE" DESIGN

Preformed headgear fits natural contours at back of head, assuring comfort.



M·S·A FACESHIELDS

DESIGNED *to fit the Head!*
No pressure points!

In every metal-finishing job where light flying particles endanger or discomfort the worker, M.S.A. Faceshields provide protection, durability, and outstanding wearing ease. Leatherette-bound visors, .020″ thick, in 4″, 6″, and 8″ lengths, are made of highest quality cellulose acetate, transparent. Non-bound .040″ and .060″ visors are also available. Three-way, fully-adjustable fiber headgear is *preformed to head shape*—with top strap supporting weight of assembly, and finger-control friction adjustment of up or down visor movement. Model shown has full-sparkshield; semi or no-sparkshield models are available. Write for descriptive Bulletin CE-16!

MINE SAFETY APPLIANCES CO.
BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH, PA.
District Representatives in Principal Cities

ANODIZING RACKS AND FIXTURES

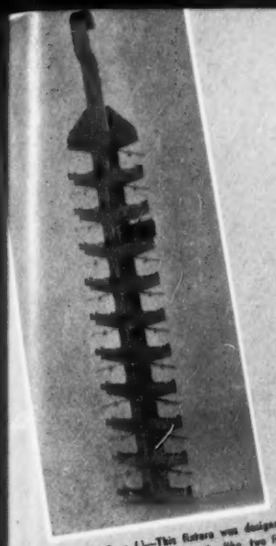
Photographs show a few styles of racks, especially adapted for anodizing tubing, castings, stampings, large sheets and a variety of small parts. The overall length of the fixtures are made to suit the depth of the tank, a 5' 0" length being standard for a tank 6' 0" deep.

All anodizing racks should be insulated with our special insulating material to minimize the amount of current consumption and also to prevent the action of the electrolyte on the riveted joints, materially lengthening the life of the fixtures.

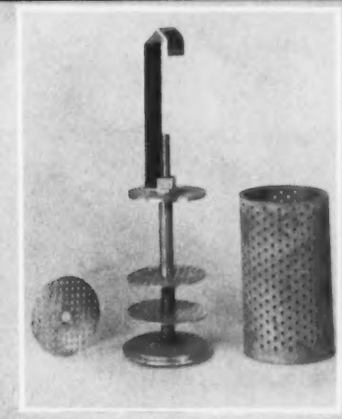
Many of the larger plants fully equipped with these fixtures are reporting a savings up to 80% in their labor costs and a 100% savings on aluminum wire.

To facilitate the design and manufacture of proper fixtures, samples or blueprints should be submitted.

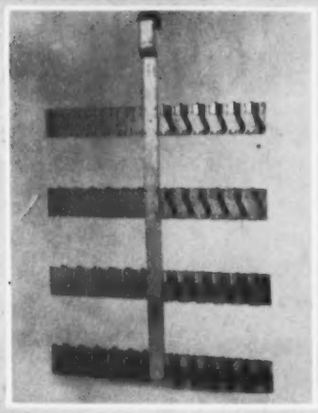
Patents applied for.



...re No. GLN-11 D (S or L)—This fixture was designed ...arily for anodizing long rib chords and the like, two fix... being used, one with a long hook and the other with a ...rt hook (S or L). This gives the parts racked a slope for drainage and to avoid gas pockets.

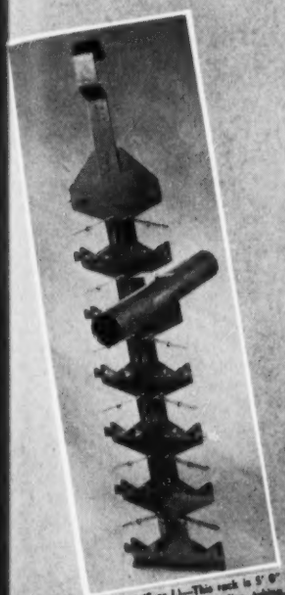


Fixture No. GLN-9-43-2 (¼" or ⅛")—This fixture is designed for small parts that are suitable for bulk anodizing. The cylinder is of "micarta" and is 12" long and 6" in inside diameter. The balance of the fixture is of 24 ST Aluminum. The cylinder will be drilled to the customer's specifications. Standard diameter holes are ⅛" or ¼". Aluminum sleeves are furnished with each fixture. This is to be used when a partly filled basket of parts is being run. The two spacers shown in the photograph below the intermediate plates are for photographic purposes only to show the fixtures more advantageously.

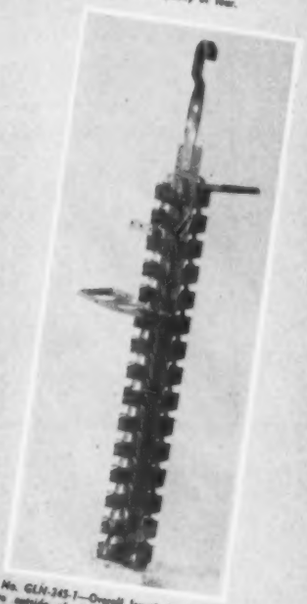


Fixture GLN No. 9-D-6—This fixture is 5' 0" in overall length and 3' 0" in overall width, has 48 openings and may be used for metal stampings and similar parts. For long narrow skins two (2) fixtures are used together. Fixtures of this type may be obtained with two (2) or more arms, depending on the width of parts to be racks. On the four (4) arm fixture shown, the distance between the arms is 8½" and the top arm is 14" below the top of the back. The slots are ⅛" wide and 2½" deep.

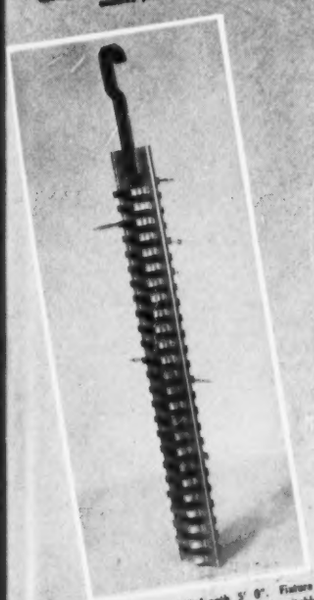
Fixture GLN No. 827—This rack is 5' 0" in overall length and designed for anodizing castings. Fixtures of this type will be designed to suit the part to be anodized and a sample should be submitted to facilitate the design and manufacture. Parts are racked on either side of the splines and the capacity of the rack depends on the size and shape of the part to be racked. The one shown has a capacity of four.



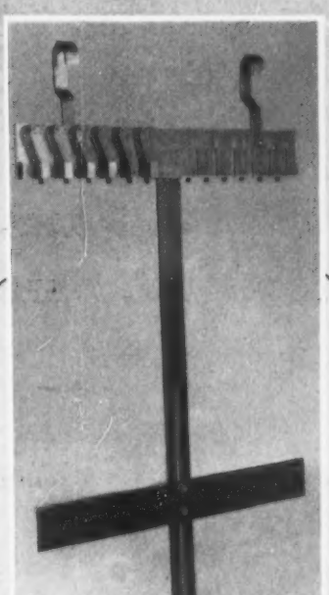
Fixture No. GLN-19 D (S or L)—This rack is 5' 0" in overall length and designed primarily to anodize tubing, two fixtures being used together, one with a short handle (S) and one with a longer handle (L). The size of the opening depending on the diameter of the piece to be racked which also determines the capacity. One rack may be used shown to anodize pieces not over 2' 0" long.



Fixture No. GLN-345-1—Overall length 5' 0" distance from spline to outside of contact is 3". Suitable for a large variety of small parts. Two fixtures may be used together for long parts. Holders may be "V"-d out for holding cylindrically shaped parts of small diameter or extrusions or the like. The fixture shown has 20 contacts (15 on either side of the spline). Handles have 90° twist so that long pieces are held lengthwise in the tanks.



Fixture No. GLN-17—Overall length 5' 0". Fixture shown has 50 openings (25 on each side of spline) suitable for a large range of small parts. Width of spline is 6". Contacts are spaced to suit the customer's requirements. Contacts are "V"-d out to loosen shaded area and to more securely hold cylindrical parts of small diameter.



Fixture No. GLN-2779—This fixture is 4' 7" in overall length and 3' 9" in overall width. The upper part of the fixture is of 24 ST Aluminum and the spline and bottom cross piece are of "Micarta". This fixture is used to anodize skins or sheet aluminum parts; two fixtures being used together, one at one end of the sheets and the other fixture at the other end of the sheets. The slots are ½" wide and 3" deep. This fixture has a capacity of 12 sheets and can be made to take any width sheet that the customer may have to anodize.
Extra long sheets of light gauge may require a third fixture for support at the center.

Fixture No. GLN 896—This type of fixture is designed primarily for castings such as the one shown or of similar shape. The overall length of this particular fixture is 5' 0". For a fixture of this type we would like to have our customer submit a sample of the piece to be racked, in order to facilitate its design and manufacture.

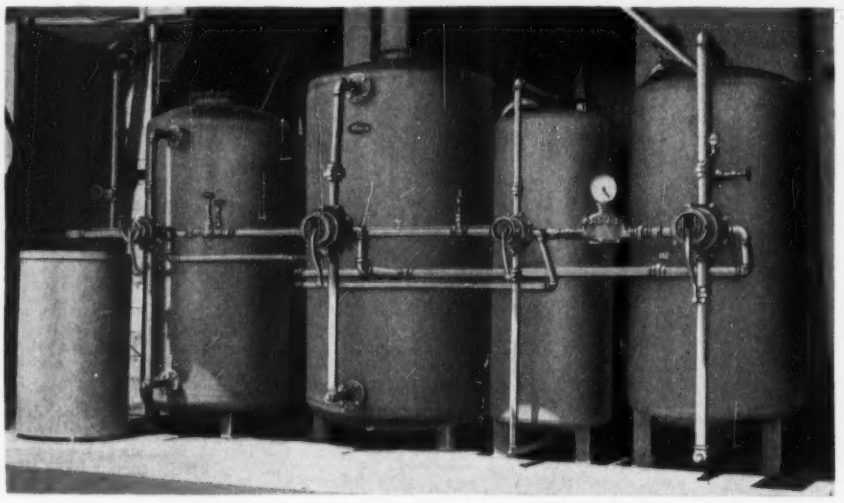
GEORGE L. NANKERVIS CO.,
5408 COMMONWEALTH AVE., DETROIT, MICH.

PURE WATER FOR PLATING

at a fraction of former costs!

De-ionized water (comparable to distilled water, but at a fraction of its cost) in plating solutions and in pre-rinse tanks eliminates the troubles due to mineral salts in water supply. Ion-exchange resins can also be used to reclaim precious metals now being washed away in solution. Pioneers in the manufacture of De-ionizing equipment, ILLCO has been called on to supply pure water in a number of plating departments, and users are enthusiastic about results. . . . Without *heat*, without fuel, ILLCO-WAY De-ionizing units are daily producing pure water to meet exacting industrial and technical standards in leading U. S. plants.

TESTED IN THE LABORATORY
ILLCO-WAY
PROVED IN THE FIELD



Typical ILLCO-WAY unit in aircraft factory. Capacity: 2,000 gallons of De-ionized water an hour. Other units have permissible flows of from 100 gallons to 50,000 gallons per hour. Similar equipment is used for plating and anodizing.

NEW CHEMICAL METHOD REPLACES DISTILLED WATER! This modern, economical method is based on ion exchange, and uses Amberlite resins. Cost of the treated water is remarkably low—only a few cents per thousand gallons. . . . Learn how ILLCO-WAY equipment can speed production, help cut costs in *your* plant! Write for literature today!

ILLINOIS WATER TREATMENT CO.

856 CEDAR STREET, ROCKFORD, ILLINOIS

WATER TREATMENT ENGINEERS

BUCKINGHAM COMPOUNDS

NOW USED IN

WAR PRODUCTION

BURRING • GREASELESS

HARDENED STEEL COMPOSITION

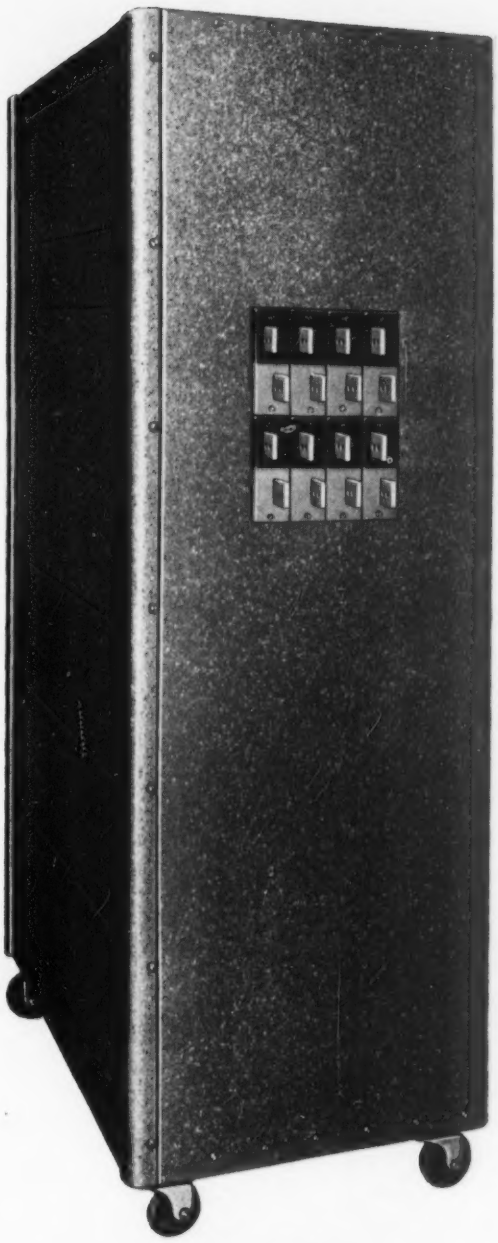
Samples Shipped Promptly

THE BUCKINGHAM PRODUCTS CO.

8900 HUBBELL AVE. DETROIT, MICH.

MULTI-PLATER

GREEN MULTI-PLATER MODEL 86



42" wide, 24" deep
approx. 81" high.

ALL IN ONE CABINET--

the MULTI-PLATER provides eight (8) separate selenium rectifier sections each having an output capacity of 6 volts 500 amperes.

For quick, simple installation and mobility, MULTI-PLATERS are mounted on casters.

Separate output terminals make it possible to connect each rectifier section to a separate tank, or several sections may be added together for higher voltage or greater current capacity, or *all* the sections may be grouped together in a single bank.

When sections are used individually, or in groups, there are *several hundred* possible combinations; for example: If all eight sections are interconnected any one of the following outputs may be obtained:

6 volts 4000 amperes,
or 12 volts 2000 amperes,
or 24 volts 1000 amperes,
or 48 volts 500 amperes.

Standard MULTI-PLATERS provide internal connections for operation from 220, or 440 volt 60 cycle 3 phase supply.

MULTI-PLATERS can be furnished for other supply voltages.

MULTI-PLATERS of lesser capacity than Model 86, as illustrated, are also available.

Write Dept. F for illustrated booklet.

W. GREEN ELECTRIC CO., INC.

ESTABLISHED 1892

Builders of SELECTRO-PLATERS and all types of rectifier equipments.

Green Exchange Bldg., 130 Cedar St, New York

Baker
Palladium Plating Solution

War-time restrictions upon plating metals have created a situation where palladium becomes of great importance to the jewelry industry and the time and effort we have devoted to the subject of plating with palladium now enables us to offer an always dependable plating solution.

Baker Palladium Plating Solution is stable and uniform in performance. *It does not decompose during use.* Both heavy and flash deposits can be made from the same solution. A flash plate, which requires no polishing, takes from 15 to 60 seconds.

If you are using some other solution, try some of ours for comparison. You can't lose anything by such an experiment and you may find that your plating troubles have been solved.

BAKER & CO., INC.

113 Astor Street, Newark, N. J.

NEW YORK **SAN FRANCISCO** **CHICAGO**

Complete Stationary Filter Systems

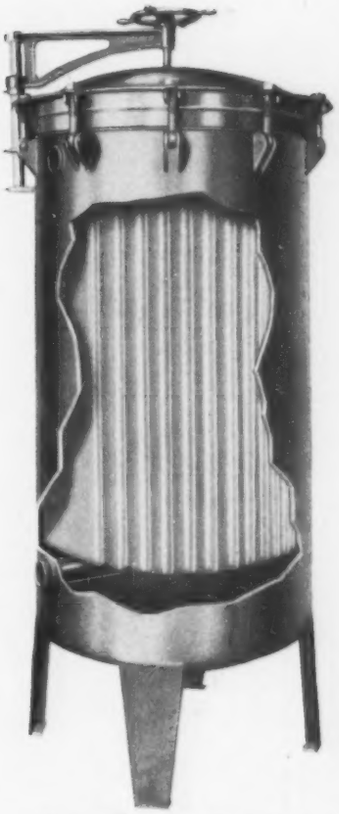


Illustration of Filter Unit

IDEAL CONTINUOUS FILTRATION AND PURIFICATION SYSTEMS FOR PERMANENT USE WITH LARGE INSTALLATIONS OF CYANIDE COPPER & BRASS, HIGH SPEED BRITE COPPER, ROCHELLE COPPER, BRITE ZINC, TIN & OTHER ALKALINE PLATING SOLUTIONS.

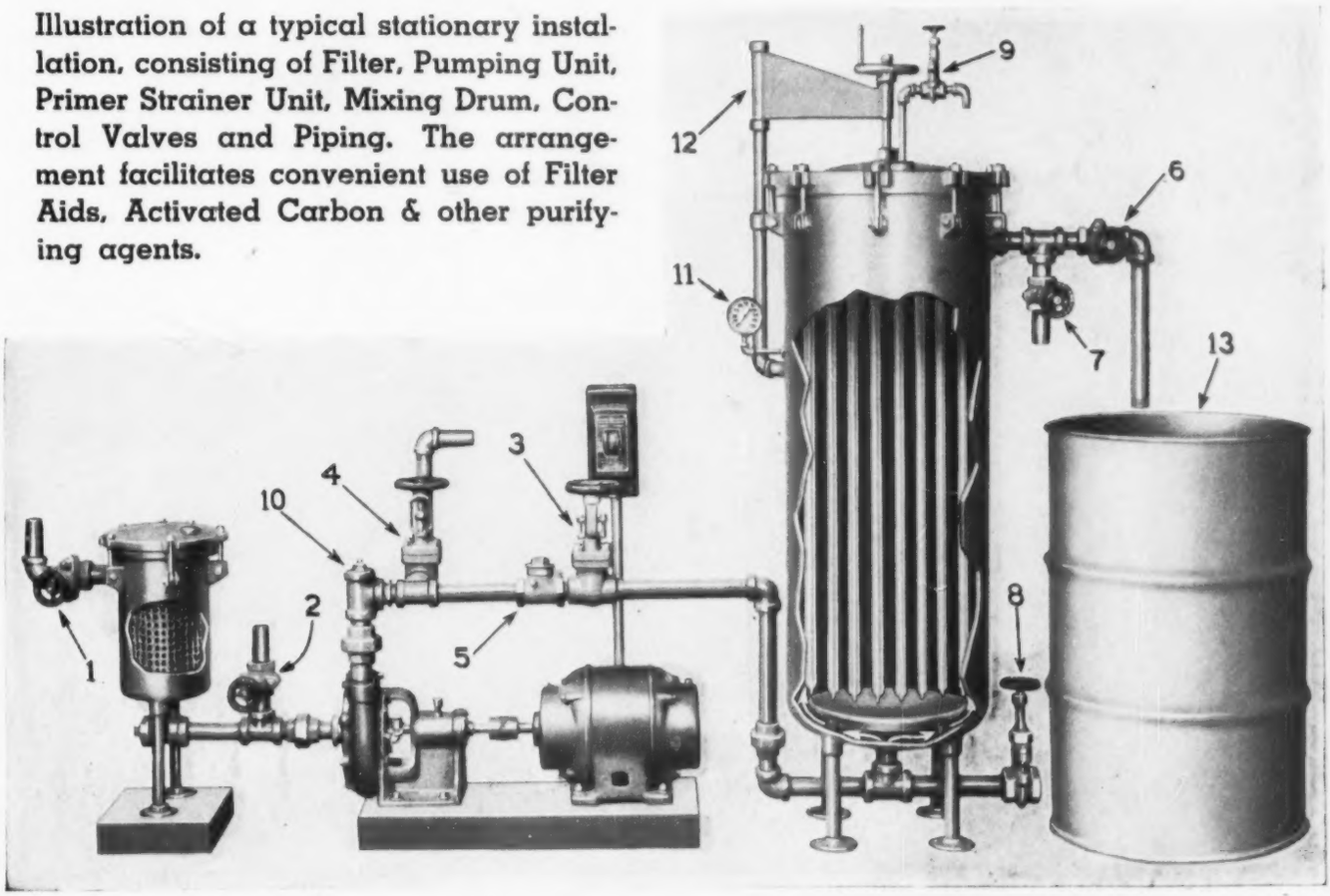
Industrial now offers larger capacity filters having up to 290 Sq. Ft. of Active filtration area, facilitating flow rates to 7200 gallons per hour.

SUPPLIED IN THE FOLLOWING SIZES:

MODELS	CAPACITY G.P.H.	FILTER TANK SIZE	OVER-ALL HEIGHT	NO. OF SCREENS	FILTRATION AREA
I-24	7200	36" x 62"	76"	17	290 sq. ft.
I-30	4600	30" x 62"	76"	14	185 sq. ft.
I-36	3000	24" x 62"	76"	11	120 sq. ft.

Capacities are based on flow rate of 25 G.P.H. for each sq. ft. of filter area, as obtained in filtering high speed Copper Solution. On Zinc & Cadmium, 15 to 20 G.P.H. for each sq. ft. are obtained.

Illustration of a typical stationary installation, consisting of Filter, Pumping Unit, Primer Strainer Unit, Mixing Drum, Control Valves and Piping. The arrangement facilitates convenient use of Filter Aids, Activated Carbon & other purifying agents.



We carry Complete Stocks of Filterbestos, Activated Carbon, Activated Clay (Super-Filtrol, and Chlor-o-cel) and all Grades of Filter Powder Ready for Shipment.

INDUSTRIAL FILTER & PUMP MFG. CO.
3017 WEST CARROLL AVENUE CHICAGO, ILLINOIS

OVER 5000 POUNDS OF
...IN ONE PLANT WITH
ANOTHER WALLOP FOR THE AXIS!

ZINC A WEEK SAVED...
PENNSALT CLEANER

EVERY POUND of essential metal saved is a blow against the enemy. Pennsalt Cleaners are doing forthright service in many industries, helping to conserve vital time and materials by faster, better metal cleaning—at lower cost.

Saving zinc by the proper removal of oil, grease and other soils from structural steel before galvanizing is an example. In one large fabricating plant rejects after galvanizing ran 20 to 25 per cent before Pennsalt Cleaners were introduced.

Now for the Pennsalt method:—Crates of steel parts are lowered by crane into a tank containing a steam-heated solution of Pennsalt Cleaner. After ten minutes they are taken to a rinse tank, then as they are removed they are water-sprayed. Pickling, rinsing, fluxing and coating operations proceed as before.

Result? Virtually *no* rejects! Average daily production up 20 per cent! And the zinc formerly lost due to stripping rejects now is *saved at the rate of over 5000 pounds per 80 hour week!* Over 260,000 extra pounds a year to help win this war. And this saving was made by only *one* manufacturer!

Many leading plants in every field of metal manufacture are saving needed materials and speeding cleaning operations with Pennsalt Cleaners. They are often able to dispense with hand labor and precleaning . . . and so cut cleaning costs.

In a wide range of duties, Pennsalt Cleaners are removing and preventing the redepositing of dirt—grease, oil, emery dust, rouge, carbon smut, grit. The metals and alloys they clean include carbon and alloy steels, stainless steel, copper, aluminum, zinc, nickel, nickel silver, Britannia metal, brass and bronze.

Whether the part is rolled, forged, stamped, drawn or cast . . . Pennsalt Cleaners are producing a remarkably clean, smooth surface that leads to a better job of Bonderizing, Parkerizing, enameling, painting, galvanizing or plating.

In the complete series of Pennsalt Cleaners, there is one which will meet the specific metal cleaning problem in *your* plant. All Pennsalt Cleaners have exceptional dissolving and emulsifying action, extraordinary lasting power and highly efficient cleansing qualities.

Let one of our experienced technical staff help you choose the Pennsalt Cleaner that will do most to save time, materials and money in your particular metal cleaning operations. Or write fully to our Pennsalt Cleaner Division, Dept. MF.

PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

1000 WIDENER BUILDING • PHILADELPHIA, PA.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • WYANDOTTE • TACOMA

US
EQUIPMENT
SINCE 1896
For Plating, Metal Cleaning, Pickling, Acid Dipping, Drying and Allied Operations
FULLY AUTOMATIC SEMI AUTOMATIC
MANUALLY OPERATED
PLATING BARREL APPARATUS
STILL TANK PLATING EQUIPMENT
VARIABLE SPEED PLATING APPARATUS
AUTOMATIC CLEANING & PLATING UNITS
CONTINUOUS ACID TREATMENT EQUIPMENT
MECHANICAL CLEANING APPARATUS
ELECTROLYTIC PROCESSING UNITS
GENERATOR EQUIPMENT
DRYERS, ETC.
U. S. GALVANIZING & PLATING EQUIPMENT CORPORATION
Incorporated 1896
31 Heyward Street, Brooklyn, N. Y., U.S.A.

Vol. 41, NO. 6 METAL FINISHING JUNE, 1943
PREPARATION, ELECTROPLATING, COATING

A SADLY NEGLECTED METAL COATING

Lead as a protective coating first came into prominence during the first World War when it was used for lining gas shells, boosters, adapters and a host of other parts where its resistance to attack by certain chemicals made it the most suitable material for the purpose. After the war its use in this country was restricted to such applications as fittings for lead storage batteries and the like where exposure to sulfuric acid was encountered, although in Europe it was employed on a much larger scale. It has taken another war and restrictions on all other available metals to demonstrate to industry that lead can be used as a general protective coating.

Like other coating metals it has certain disadvantages, the most important of which is its softness. This, however, can be counteracted to a great extent by increasing the thickness of the deposit. *The electrochemical equivalent of lead is higher than that of any common metal except silver and gold*—at the same current density, lead deposits will be more than *twice* as thick as zinc when plated for the same time. Since lead is also the cheapest of coating metals, thick coatings are entirely practicable.

Some resistance to the use of lead for coating iron and steel has been due to its being more noble than the latter, so that it would be expected to act like copper and nickel, protecting the basis metal *mechanically* rather than *electrochemically*. Tests seem to indicate, however, that unlike copper and nickel coatings, rust which forms at pores in lead deposits tends to fill the pores, and though this rust discolors the surface, it does not spread under it to cause flaking of the coating metal. Lead coated fence wire showed a weight loss of only five per cent after eight years' exposure, with negligible change in its physical characteristics.

The metal may be applied by hot dipping, the present trend being to use alloys containing 90-95 per cent lead, with small amounts of tin, zinc, silver, antimony and bismuth added to promote adherence, although pure lead has been applied adherently to iron and steel pole line hardware under closely controlled conditions with excellent results in service. The lead or lead alloy may be handled in the usual hot galvanizing equipment. Due to the fact that lead does not alloy with iron to any appreciable extent, there is no dross or attack on the pot as in the case of zinc.

Lead is most easily applied by electrodeposition in adherent form, without the use of critical metals, from a number of baths, including fluoborate, sulfamate, perchlorate, fluosilicate, phenolsulfonate and others. The fluoborate bath is the most popular although sulfamate baths will undoubtedly come into much wider use when the material becomes more generally available after the war.

Many lead plating installations are already in operation and more are being considered. As a base for paint and other organic finishes, lead is unsurpassed and this, in addition to its other advantages, makes it a most suitable protective coating, not only as a substitute for more critical metals during the present emergency, but for general use in peacetime.

CONVENTION PROGRAM

SUNDAY, JUNE 6th

3:00 P. M. REGISTRATION. Main Floor, Hotel Statler

MONDAY, JUNE 7th

Monday Morning

8:00 A. M. REGISTRATION continued. 17th Floor Lobby, Hotel Statler.

9:00 A. M. OPENING SESSION.17th Floor Auditorium, Hotel Statler. Invocation by *Rev. Frank C. Mesle;* Welcome by *The Hon. Joseph Kelly,* mayor of Buffalo; Response by *Dr. Christian J. Wernlund,* general chairman; Greetings from the Buffalo Branch by *Joseph Ruff,* president; Presidential Address by *Charles C. Conley,* president of the Society.

10:00 A. M. FIRST EDUCATIONAL SESSION. 17th Floor Auditorium, Hotel Statler. *Joseph Ruff,* president of Buffalo Branch, presiding. Papers by *W. W. McCord, William Blum, Ph.D.,* and *Charles L. Mantell, Ph.D.*

Monday Afternoon

2:00 P. M. SECOND EDUCATIONAL SESSION. 17th Floor Auditorium, Hotel Statler. *Horace Smith,* Newark Branch, presiding. Papers by *E. A. Anderson, W. B. Cooper, F. W. Rock, F. P. Green* and *H. L. Kellner, Ph.D.*

Ladies

2:00 P. M. DEMONSTRATION OF GLASS BLOWING by William Ball. 17th Floor Exhibition Room. Hotel Statler.

Monday Evening

8:00 P. M. INTERNATIONAL FELLOWSHIP CLUB—OPEN HOUSE. Terrace Room, Hotel Statler.

TUESDAY, JUNE 8th

Tuesday Morning

8:30 A. M. THIRD EDUCATIONAL SESSION. 17th Floor Auditorium, Hotel Statler. *W. M. Phillips,* Detroit Branch, presiding. Papers by *W. E. Moline, R. A. Schaefer* and *J. B. Mohler, F. C. Mesle, J. F. Kuzmich* and *F. Page, Jr.*

Ladies

9:00 A. M. TRIP TO NIAGARA FALLS. Assemble Hotel Statler Lobby.

Tuesday Noon

12:30 P. M. LUNCHEON in the Terrace Room, Hotel Statler. Speaker: *Dr. Frederick A. Hodge.*

Ladies

12:30 P. M. AUNT ELLA LUNCHEON—NIAGARA FALLS. Entertainment by *D. X. Clarin.*

Tuesday Afternoon

2:30 P. M. FOURTH EDUCATIONAL SESSION. 17th Floor Auditorium, Hotel Statler. *Charles Clindinin,* president, Chicago Branch, presiding. Papers by *A. F. Fletcher, H. Van der Horst, A. W. Logozzo, G. E. Huenerfauth* and *O. G. Hogaboom.*

Tuesday Evening

8:00 P. M. FIFTH EDUCATIONAL SESSION, 17th Floor Auditorium, Hotel Statler. *Frank C. Mesle,* Syracuse Branch, presiding. Papers by *C. P. Mann, W. S. Crandall, W. H. Lutz, William H. Price, Jr., Walter Meyer, Ph.D.,* and *F. MacIntyre* and *R. O. Hull*

Ladies

8:00 P. M. CARD PARTY. Chinese Room, Hotel Statler.

WEDNESDAY, JUNE 9th

Wednesday Morning

8:30 A. M. SIXTH EDUCATIONAL SESSION. 17th Floor Auditorium, Hotel Statler. *J. Acheson,* Toronto Branch, presiding. Papers by *E. M. Baker* and *R. Twyning, E. C. Rinker, R. J. Dammers, R.. F. Yates* and *E. W. Cochran.*

Ladies

9:00 A. M. TRIP TO ALLBRIGHT ART GALLERIES AND BOTANICAL GARDENS. Assemble Hotel Statler Lobby.

Wednesday Noon

Ladies

12:30 P. M. LUNCHEON. The Park Lane. Delaware Avenue and Gates Circle.

Wednesday Afternoon

2:00 P. M. ANNUAL BUSINESS SESSION. 17th Floor Auditorium, Hotel Statler. Election of Officers, Selection of Next Convention City.

Wednesday Evening

7:00 P. M. BANQUET; FLOOR SHOW, DANCING. Grand Ballroom, Hotel Statler.

AMERICAN ELECTROPLATERS' SOCIETY TO HOLD 31st ANNUAL CONVENTION AT BUFFALO, JUNE 7-8-9

Charles C. Conley
President

Electroplating's role in the job leading to the day of Unconditional Surrender and our victory is the theme of the 1943 Convention which opens June 7th with headquarters at the Statler Hotel in Buffalo.

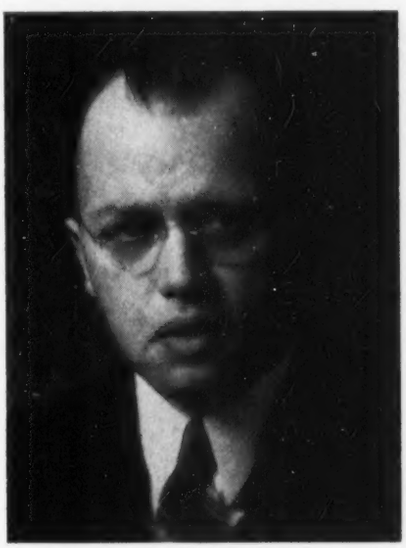
The schedule features six educational sessions which include the presentation of a total of 29 papers, abstracts of which appear on the following pages.

Dr. Christian J. Wernlund is General Chairman of the Convention. His committee is composed of *W. M. Fotheringham*, Program and Publicity; *W. D. Hart*, Registration; *Seibert Johnson*, Recreation; *Charles Logan*, Plant Visitation; *J. C. Mays*, Financial Secretary; *J. Moneypeny*, Exhibits; *Don Rice*, Entertainment; *John Rooney*, Educational; *Joe Ruff*, *Advisory*.

The International Fellowship Party is planned for Monday evening. At Tuesday's luncheon in the Terrace Room, *Dr. Frederick A. Hodge* will be the speaker. And the Convention Banquet with dinner, dancing and entertainment will take place on Wednesday evening.

Mrs. W. D. Hart, chairman of the Ladies' Committee, and its other members, *Mrs. S. S. Norman*, *Mrs. C. T. Wernlund*, *Mrs. T. C. Mays* and *Mrs. L. A. Nowak*, have arranged an equally attractive program for the women attending the convention.

George J. Wagner
First Vice-President



Ellsworth T. Candee
Past-President and Acting Secretary

Clarence C. Helmle
Third Vice-President

Maurice R. Caldwell
Second Vice-President

ABSTRACTS OF EDUCATIONAL PROGRAM OF A.E.S. CONVENTION

MONDAY MORNING SESSION

June 7, 1943—10:00 A. M.

17th Floor, Auditorium, Hotel Statler.

"THE EFFECTS OF GOVERNMENT RESTRICTIONS ON THE ELECTROPLATING INDUSTRY"

WM. McCORD, War Production Board, Washington, D. C.

This paper will give a bird's-eye view of how government restrictions have affected the electroplating industry during the past year, and what further changes are in the offing. The expansion of current plating requirements in various lines and possible new applications of electroplated finishes will be of particular interest. Mr. McCord's estimate for the future of electroplating during wartime should be particularly timely and helpful.

"A REPORT ON THE RELATION OF ELECTROPLATING TO THE MILITARY REQUIREMENTS"

WM. BLUM, Ph.D., U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

Dr. Blum will review a wide variety of applications of electroplating in connection with specific military requirements. His broad experience and intimate knowledge as regards the needs of the war industries enable him to present a widely diversified factual picture of what lies ahead for the electroplaters of America.

"THE PLATING OF MANGANESE ON OTHER METALS"

C. L. MANTELL, Ph.D., Consultant, New York, N. Y.

Dr. Mantell's contributions to the development of the electrolytic large-scale production of manganese make this subject of unusual interest. This paper first reviews the major obstacles encountered in the electroplating of manganese on other metals for both protective and decorative purposes. This is followed by a description of the type and character of deposits obtainable and the present and prospective utility of these deposits. A new, unique plating process may soon be available. The abundance, cheapness and unusual properties of manganese make this paper of outstanding significance.

MONDAY AFTERNOON SESSION

June 7, 1943—2:00 P. M.

"THE CRONAK PROCESS"

E. A. ANDERSON, The New Jersey Zinc Company, Palmerton, Pa.

This paper will consider the Cronak process from the standpoint of both procedure and performance. It will attempt to answer the questions as to why certain steps in procedure are acceptable while others are not. It will also attempt to clarify the question of what can be expected from the film in service performance.

"THE ELECTROTINNING OF STRIP STEEL WITH THE CROWN CORK AND SEAL COMPANY'S PROCESS"

W. B. COOPER, The Crown Cork and Seal Company, Baltimore, Md.

The development of the electrotinning process on steel strip is a unique engineering achievement which promises to be duplicated with copper, lead, zinc and other metals after the war. Electroplating will thus tend to concentrate in large scale production units. This paper will review the electrolytic process and illustrate some of the mechanical problems encountered in putting the strip plating process into continuous high speed production.

"SOLVING BURRING PROBLEMS"

F. W. ROCK, The Roberts Rouge Company, Stratford, Conn.

To solve a difficult burring problem in a concern producing vital war items, the company represented in cooperation with a brush wheel manufacturer, provided a most effective abrasive compound to properly adhere to relatively coarse wire ends, wire size being 0.005 to 0.010.

This successful performance has led to the wide adoption of both wire and tampico brush wheels operated at high surface speed as a superior method of removing burrs and tool marks from various metal parts.

The flexibility of such wheels permits all irregular contours, indentations, and recesses, as well as flat places, to be fully contacted, leaving a smooth surface with essential dimensions adequately protected.

"ROTO-FINISH. THE MODERN METHOD OF DE-BURRING METAL PARTS"

F. P. GREEN, Crown Rheostat & Supply Co., Chicago, Ill.

Roto-finish is obtained by a process in which the metal parts are rolled in mineral chips and compound in special type barrels. High precision parts and rough castings, whether of steel, bronze, aluminum, zinc or stainless steel, all lend themselves readily to this process. Likewise, the size of parts varies in mass from a gram to one hundred pounds.

"BURRING BY FLEXIBLE POLISHING WITH GREASELESS COMPOUNDS"

H. L. KELLNER, Ph.D., The Lea Manufacturing Co., Waterbury, Conn.

When parts and burrs are of such nature that they can only be cut by abrasives firmly fastened to revolving wheels and bobs, burring can best be accomplished by polishing. Conventional set-up wheels are used where edges are regular, but with irregular contours, flexible polishing wheels, formed and maintained for continuous operation by frictional transfer of greaseless compound, are indicated.

By selection of wheels, from felt through sewed and loose buffs to string wheels, and the grade of greaseless compound, used alone or with a pre-coat frictionally applied, practically any degree of flexibility of the polishing face required by the part in question can be attained.

TUESDAY MORNING SESSION

June 8, 1943—8:30 A. M.

"PLATING WITH BLACK NICKEL"

WALTER E. MOLINE, The National Cash Register Company, Dayton, O.

Starting with a standard bath, each of the components have been varied separately and their effect upon the final deposit noted. Other optimum operating conditions, i. e. current density, pH and temperature have also been established. Charts and graphs are included covering most of the variables. Low ammonium sulfate concentrations are to be avoided, while variations in pH from 5.0 to 6.2 apparently have but little effect.

Kodachrome slides of various test panels are included to bring out visually conclusions reached by the author.

"RAPID SILVER PLATING"

R. A. SCHAEFER and J. B. MOHLER, The Cleveland Graphite Bronze Co., Cleveland, O.

A new high pH cyanide silver bath was developed for the rapid electrodeposition of silver at a cathode current density of approximately 100 amperes per square foot. The bath was found to give a dense and ductile deposit and consumed a small quantity of chemicals per pound of silver deposited under rapid plating conditions.

Cast silver anodes of approximately 99.9% purity were used. These anodes were neither cold worked nor annealed and the electrolyte was found to be less sensitive to anode impurities than the conventional silver plating baths.

"STUDY OF THE ADHERENCE AND CORROSION RESISTANCE OF SILVER PLATE ON STEEL"

F. C. MESLE, Oneida Ltd., Oneida, N. Y.

Mr. Mesle's paper will deal briefly with the adherence of silver when plated directly on steel with the usual silver strike foundation coating, and the influence of heating on adhesion. The author will then give his experience with phosphate coatings under the silver and their influence on adherence and corrosion. In conclusion he will review his experiences with silver as a protection against corrosion on ferrous metals. This paper calls attention to simple yet basic facts of vital concern to all those interested in the newer uses for silver plate.

"POWDER METALLURGY AND ITS RELATION TO THE ELECTROPLATING INDUSTRY"

J. F. KUZMICH, Stevens Institute of Technology, Hoboken, N. J.

This paper describes the manufacture of metal powders and their fabrication into useful molded products. Some of the products made by this process are tungsten lamp filaments, cemented carbide tool edge inserts, porous bearings, metal filters, clutch facings and brake linings, commutator brushes, and diamond tools and wheels.

The powders are first compressed cold at high pressures to form the desired exact shape and the latter are then heat-treated or sintered to give the required strength.

The powders are prepared by both chemical and electrolytic processes. Both copper and iron powders are made on a large scale by electrolytic processes. Steel plates are also copper or tin plated to facilitate bonding of powder mixtures.

"ZINC-SABOTEUR OF STEEL AT ELEVATED TEMPERATURES"

F. PAGE, Jr., Solar Aircraft Company, San Diego, Calif.

This paper calls attention to the embrittling effect of molten zinc on highly stressed steels and the hazards this entails. As little as one milligram of zinc in contact with stressed stainless steel at 1400° can cause cracking. Other steels, for example, S.A.E. 2330 and S.A.E. 4130 show a similar weakness in combination with zinc. Exhaust manifolds fastened with zinc plated bolts are liable to failure with possible loss of aircraft and crew. The data are illustrated by a motion picture supplied through the courtesy of The Solar Aircraft Company.

VICTORY LUNCHEON

June 8, 1943—12:30 P. M.

Hotel Statler—Terrace Room

DR. FREDERICK A. HODGE, Speaker

This luncheon is a special feature where goodfellowship can be enjoyed to the full. Dr. Hodge, the speaker, is a well-known radio commentator who has devoted his time exclusively for the past five years to writing and speaking. A keen analyst, a man of deepest culture and fullest education, Dr. Hodge brings to the platform a fascination born of profound scholarship and acute discernment.

He is a graduate of the University of Virginia and formerly was

ABSTRACTS OF EDUCATIONAL PROGRAM OF A.E.S. CONVENTION

an instructor in Philosophy and Education at that university and in other southern colleges. During the first World War he entered the chemical engineering field with the du Pont Company.

TUESDAY AFTERNOON SESSION

June 8, 1943—2:00 P. M.

"THE HARD CHROME PLATING OF CUTTING TOOLS"

AUSTIN F. FLETCHER, The Brewer-Titchener Corp., Binghamton, N. Y.

The solution composition and operating technique employed in the hard chrome plating of cutting tools, such as drills, reamers, taps, tool bits, etc., are described, including preferred methods of racking, and of handling the work before and after plating. The actual amount of increased production and tool life realized by a given thickness of chrome plate shows what can be accomplished.

"POROUS CHROME"

H. VAN DER HORST, The Van der Horst Corp. of America, Olean, N. Y.

This paper deals with the Van der Horst process of porous chrome plating engine cylinders and piston rings. The process serves to reduce cylinder wear, ring wear, ring groove wear and in general tends to a more reliable engine. It also serves to reclaim worn aircraft cylinders. The chrome deposit must be porous for lubrication purposes because ordinary dense chrome does not wet with oil.

"RACKING IN HARD CHROME PLATING"

A. W. LOGOZZO, The Hartford Chrome Corp., Hartford, Conn.

This article deals with the fundamental principles of the mechanics of hard chrome from the practical platers' standpoint. Simple and effective racks will be illustrated, including auxiliary anode hookups.

"INSTALLING EQUIPMENT TO OBTAIN THE GREATEST AMOUNT OF AUTOMATIC CONTROL AND HANDLING"

G. E. HUENERFAUTH, Crown Rheostat and Supply Co., Chicago, Ill.

Due to the development of high current density plating solutions which require closely controlled operating conditions and other electrolytic processes, automatic controls and uniform treatment have become very important. By keeping these facts in mind when making new installations, it is easy to obtain simple but effective layouts at a nominal cost.

"INDUSTRIAL SALVAGE BY ELECTRODEPOSITION"

OVIDE G. HOGABOOM, The New Britain Machine Company, New Britain, Conn.

This paper deals with reclaiming over-machined and worn parts by heavy electrodeposits of copper, nickel, chromium, or iron directly on the base metal. Many diagrams are given to show how to set up various machine parts for plating inside and outside dimensions, not only for pieces which fit into the baths but also for work larger than the tanks themselves.

These sketches clearly illustrate the special technique used and the simplified racks for many common jobs and those that are irregular and intricate.

This interesting paper closes with pictures of shafts reclaimed by electrodeposited iron.

TUESDAY EVENING SESSION

June 8, 1943—8:00 P. M.

"RADIANT GAS HEAT IN BAKING"

C. P. MANN, The Selas Co., Philadelphia, Pa.

The advantages and limitations of radiant gas heat are reviewed and compared with infra-red and convection heating. The applications of radiant gas heat include baking and curing varnishes, lacquers, and plastics, baking of food products, fusing dusted powders and heat flowing tinplate.

A discussion of drying rates, speed of work travel, temperature ranges, and other equipment problems is also included.

"INFRA-RED APPLICATIONS IN WAR-TIME INDUSTRY"

W. S. CRANDALL, The Fostoria Pressed Steel Co., Fostoria, O.

This paper will briefly describe the operation and advantages of infra-red heating. This will be followed by specific application descriptions on dehydration, drying, preheating and baking.

"INDUSTRIAL PAINT COATINGS"

W. H. LUTZ, Pratt & Lambert, Inc., Buffalo, N. Y.

A review of paint products used for the production finishing of metal surfaces in industrial plants. Each of the common finish types is evaluated on the basis of raw material composition, general characteristics, and protective qualities. These types include oil paints, phenolic, alkyd, urea, vinyl, and acrylic compositions, and nitrocellulose lacquers. Metal pretreatments prior to finishing, finishing procedures and baking processes are outlined.

"THE BLACK OXIDE TREATMENT OF STEEL"

WM. H. PRICE, Jr., Mitchell-Bradford Chemical Company, Bridgeport, Conn.

Especial importance is now attached to the commonly-known "black oxide" surface treatment of steel, (copper, and brass), because of the diminishing supply of the more conventionally used copper, zinc, chromium, cadmium and nickel—and therefore the criticalness of these formerly used protective platings.

Although low in salt-spray test resistance, laboratory research, and more importantly, actual field testing under practical use conditions are determining that this treatment of steel has wide and increasing effectiveness and usefulness among hundreds of war production items.

Adaptable for use with easily-dispersed coatings of oil or wax, it also provides a splendid bonding medium for paints, lacquers, and enamels.

"BLACKENING OF FERROUS AND NON-FERROUS METALS"

By WALTER R. MEYER, Ph.D., The Enthone Co., New Haven, Conn.

Methods are discussed for the blackening of iron and steel by treatment in fused salts. Treatments for producing black coatings upon zinc, cadmium, copper, nickel, aluminum and their alloys are described. Considerable treatment is given ammoniacal copper solutions for blackening brass. The effects of variations in solution composition and the alloy being blackened are discussed.

New information on black nickel plating such as the effects of pH, current density, temperature is given. Recent tests on the composition of black nickel deposits are presented.

WEDNESDAY MORNING SESSION

June 9, 1943—8:30 A. M.

"PLATING TEST CONTROL OF PLATING BATHS"

F. MacINTYRE and R. O. HULL, The du Pont Co., Electroplating Division, Cleveland, O.

This paper describes the means for controlling the common plating baths by determining the behavior of a solution sample in a specially designed small plating unit, the Hull Cell. Plating tests can be made the basis for establishing the optimum concentrations of both the primary bath constituents and addition agents and the effects of bath impurities, decomposition products of addition agents, accumulation of carbonate (in cyanide baths), and physical variables such as temperature, agitation and pH.

"THE RATE OF SAPONIFICATION IN METAL CLEANING—A PRELIMINARY STUDY"

E. M. BAKER, Ph.D., and R. TWYNING, University of Michigan, Ann Arbor, Mich.

This paper deals with the rates of saponification of the constituents in the binder or greasy materials in polishing and buffing compositions, and the effects of the soaps formed on the saponification reaction.

"THE EFFECTS OF VARIOUS ANIONS IN METAL CLEANERS"

E. C. RINKER, Oakite Products, Inc., New York, N. Y.

The compositions of various types of alkaline soak cleaners are described and the results obtained in removing various grease films are charted.

The use of acid cleaning compounds is reviewed and illustrated with photo-micrographs.

Preferred methods of cleaning aluminum before spot welding to provide low surface sheet-to-sheet resistance are described. The results obtained are illustrated by a chart for Alclad surfaces cleaned in proprietary non-etching acid type cleaners.

"THE OPERATION OF MODERN DEGREASERS"

R. J. DAMMERS, G. S. Blakeslee & Co., Chicago, Ill.

The paper will consist of a discussion on the parts cleaned prior to plating and the different types and kinds of surfaces which are encountered, the various oils and greases to be removed, and the effect of heat on these, due to cutting, drawing, shaping, etc. This paper concludes with a brief resume of the equipment in current use in handling present day cleaning problems.

"THE PRACTICAL ASPECTS OF PLATING ALUMINUM WITH THE KROME-ALUME PROCESS"

RAYMOND F. YATES, Krome-Alume, Inc., Lockport, N. Y.

This paper deals with plating on aluminum from the standpoint of the "man in the shop" with a full discussion of the common problems as they relate to successful depositions of nickel, chromium, copper, silver, cadmium, etc. Special emphasis will be laid on the plating of the various Dural alloys, the most difficult to plate of the aluminum series. The paper will also deal with the special applications of the process as they relate to plating aluminum with brass for rubber adhesion, pistons for wear resistance, copper for soldering and silver for low resistance to ultra-high-frequency radio currents.

"COMMERCIAL ELECTROPLATING PAST AND FUTURE"

E. W. COCHRAN, The National Cash Register Co., Dayton, O.

This paper calls attention to the need of post-war planning in the electroplating industry with the suggestion that the efficiencies and speeds of some plating processes should be materially improved. The possibilities of greatly improved electrodeposits as regards brightness, throwing power, porosity and ductility are brought down to specific cases. The need for coloring these deposits, the deposition of new alloys, and the expansion of plating processes are also discussed.

INTERNATIONAL FELLOWSHIP CLUB

Charles Schlott
Chairman

Incumbent Officers

Chairman ..... Charles Schlott,
Egyptian Lacquer Manufacturing Co.,
New York, N. Y.

First Vice-Chairman ..... William M. Cole,
J. B. Ford Sales Co.,
Wyandotte, Mich.

Second Vice-Chairman ..... Frederick Gumm,
Frederick Gumm Chemical Co.,
Kearny, N. J.

Permanent Secretary ..... Thomas A. Trumbour,
Metal Finishing,
New York, N. Y.

According to word received from the program committee, the International Fellowship Club will play its usual part in entertaining the registrants of the A.E.S. Convention in Buffalo this year.

Annual Luncheon

The Annual Luncheon is scheduled for noon on Monday, the first day of the meeting, to provide adequate time before the commencement of the Second Educational Session at 2 P. M., for a leisurely meal, the election of officers, discussion and final arrangements for the Open House to be held that night. This year, only members may attend this annual meeting.

Thomas A. Trumbour
Permanent Secretary

Open House

On Monday evening, in the ballroom of the Statler Hotel, the I. F. C. will hold its annual Open House. All registrants, both men and women, are cordially invited to attend.

A buffet supper will be served from 8 to 10 P. M., and dancing will continue until closing. Admission will be by Fellowship ticket.

Frederick Gumm
Second Vice-President

Since the purpose of Open House is to offer an opportunity for all registrants to become better acquainted and thus create more complete cooperation within the industry, it is hoped that all will attend.

A program, including a list of the contributors to this popular feature, will be distributed.

William M. Cole
First Vice-President

A Double Invitation

Open House is sponsored by the International Fellowship Club and is provided by the generous contributions of various firms who sell to the plating and finishing industry. These firms and their representatives join the I. F. C. in inviting all registrants at the A. E. S. Convention to attend their party.

Chromium Plating of Dies and Tools

By D. A. COTTON

Process Laboratory, Delco-Remy Division, General Motors Corp., Anderson, Ind.

AS a preface to a discussion of chromium plating, a short review of the history of the art is worthwhile.

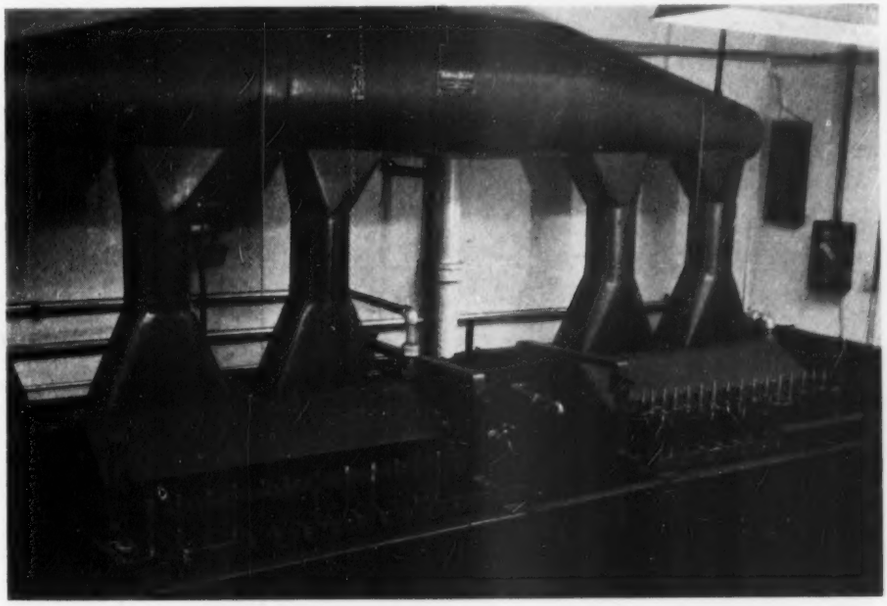
Junot deposited chromium nearly ninety years ago (1853) but to Bunsen, who used a chromous-chromic bath, is given the credit by some for having first electro-deposited chrommium (1854). Geuther apparently was the first to accomplish this from chromic acid solutions (1856).

Placet and Bonnet proposed the use of chromic acid baths to which various other acids, including sulphuric, were to be added (1894). Carveth and Curry, in work at Cornell University, verified in part, the proposals of Geuther, Placet and Bonnet by proving that chromium could be deposited from chromic acid solutions providing a foreign acid, preferably sulphuric, was present and a high current density was employed (1905).

A few years later Sargent, in extensive researches carried out at Cornell under the direction of Dr. Bancroft and Dr. Carveth, determined a considerable number of factors important in chromium plating, including a satisfactory bath formula made up with chromic acid and chromium sulphate, suitable conditions of concentration, current density and temperature, the function of lead anodes, and the necessity for close regulation.

Following the publication of Sargent's work in 1920, interest in the process increased rapidly and before the end of 1923, a half dozen or more companies in the United States had development work in progress, which soon lead to extensive commercial practice.

By 1925 the U. S. Bureau of Printing and Engraving had successfully applied chromium to their printing plates and the facts were presented that year at the annual convention of the American Electroplaters' Society. Also in this same year, 1925, General Motors had chromium plated parts on its own Oldsmobile cars.



Two 150-gallon plating tanks and one of the rinse tanks. The tank on the right is plating shafts which are being salvaged and the one on the left is plating plug gages.

From that time on, since chromium had many advantageous properties such as hardness, resistance to wear and corrosion and unusual smoothness, its commercial applications increased by leaps and bounds.

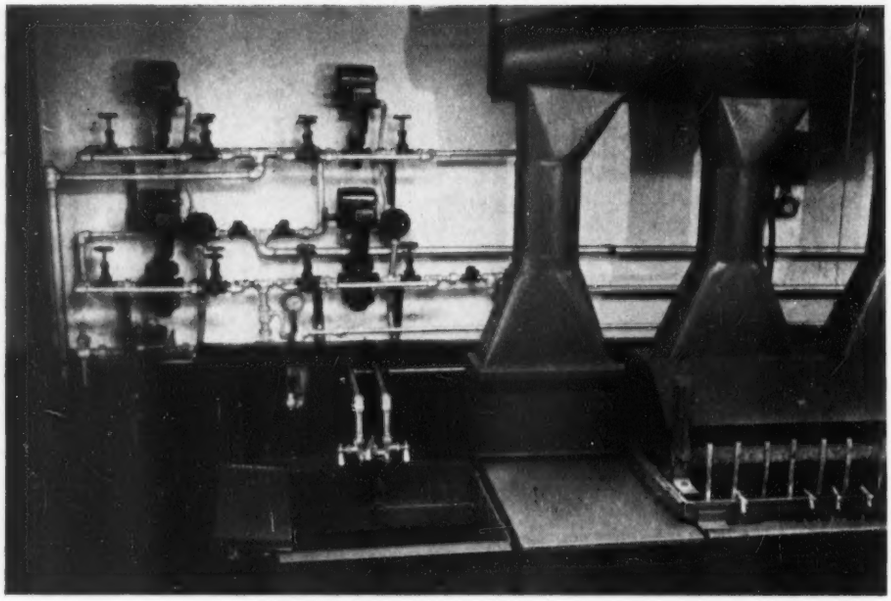
Along with the sweet we have to take the bitter. We plate from a hexavalent solution which yields a small weight of metal per ampere-hour and this is made worse by a low cathode efficiency. The throwing power is poor and bright plating is obtained only by controlling temperature and current density between comparatively narrow limits.

In 1928 we began here at Delco Remy to salvage plug gages that had worn undersize, by plating them slightly oversize with chromium and then grinding them back to the desired diameter.

Whereas the procedure had been to use the worn gages for smaller work and buy new ones of larger sizes, we were now able to use gages over and over indefinitely, thus saving the price of new gages.

After we had become proficient in plating plug gages, we started on ring gages and as time went on, gradually added other tools until today there are probably a hundred or more types of work handled by us. These include:

Tools	*Dies*
Broaches	Drawing
Burnishing tools	Coining
Taps	Heading
Reamers	
Drills	
Spot facers	
Cams	
Drill bushings	
Spinning tools	
Drill jigs	
Hobs	
Files	
Rolls	
Chuck heads	
Milling Cutters	
Plug Gages	
Ring Gages	
Snap Gages	
Thread Gages	
Threading Dies	
Molds for plastic resins	
Molds for rubber castings	
Molds for generator and starter brushes	
Inserts for molds	
Knockout pins for molds.	



Temperature control valves and piping.

Drills, taps and reamers used on plastic molded parts very soon wear undersize due to the abrasive action of the material. We have found that taps which had to be replaced every one or two hours when unplated, will run eight hours or more if chromium plated. Spinning tools used for brass do not tear or deface the metal, when chromium plated. Files which are used on hard alloy steels are chromium plated to secure longer life for the files and faster cutting qualities. We use some tool steels which even new files will hardly cut, unless they are first chromium plated.

Plating plastic molds is a big field in itself. Molding materials exert an etching action on the steel mold, which not only produces an inferior luster on the casting, but even causes the molded parts to stick in the molds. For this reason it was formerly necessary to remove molds from the presses at intervals varying from hours to a week or two, to repolish them.

We now plate molds with at least one thousandth of an inch of chromium before putting them into production and they are seldom, if ever, repolished during their working life. The cavities of new molds are made about two thousandths larger so that the plating brings them up to size. Of course, the male parts are made smaller by the same amount.

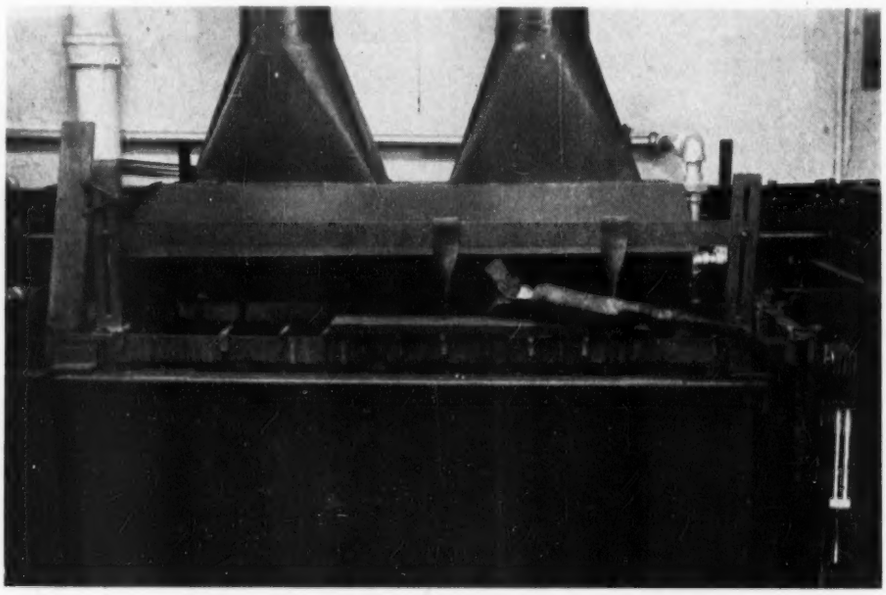
Another valuable application for chromium is on drawing dies. The deep drawing of sheet metal is likely to produce scoring on the sides of the finished parts, which in cases where these parts are to be subsequently plated or painted, necessitates a polishing operation to remove the lines in the metal. Chromium plating the dies not only improves the appearance of the parts, but reduces finishing operations and prolongs the dies' life.

Still another valuable use for chromium is on the rams of the hydraulic presses used in plastic molding. We discovered many years ago, that a cast iron ram, after being chromium plated, almost never had to be repacked. The chromium apparently reduces the friction between the iron and the leather packing gland to such a degree that wear is practically eliminated. The practice of plating these rams results in an enormous saving of production time otherwise lost in shutting down the presses, to say nothing of the actual cost of the packing rings.

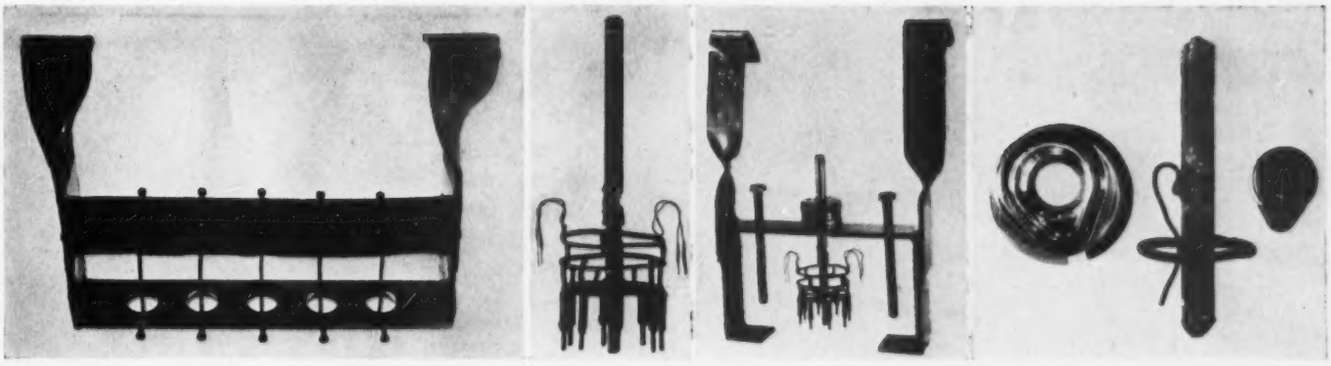
One of the most important uses for chromium plating is in saving dies which might otherwise have to be made up new. We all recall the days when a toolmaker, who may have made a mistake and got a dimension undersize, would lament because he had no "putting-on tool." Nowadays we have a "putting-on tool" in the form of chromium plating which can be employed to build up a dimension, thus saving duplication of work already done and the attendant loss of production time due to delay in making a new die.

Taking all these applications into consideration, it is obvious that a chromium plating equipment can be used to save its cost many times over every year.

The savings which can be effected by the salvage of worn gages, worn parts in machine tools and dimensional changes in dies, can easily be calculated. They are equal to the difference between the cost of new parts and the cost of salvaging the old ones by the application of chromium plating. The cost of reoperation should not be over 10% of the cost of the tools, so the savings resulting from salvaging alone, will amount to many thousands of dollars per year. These direct savings really amount to only a small part of the total savings to the



Arrangement for plating with inside anodes. The single pole, double throw switch at the end of the tank in the position shown, has disconnected all the tank anodes from the circuit and made positive the cable which is clipped onto the inside anode.



Reading from left to right: Multiple fixture for plating 5 ring gages at a time. . . . Lattice-work anode as now used for the same job. . . . Type of fixture which can be used for a wide variety of inside plating but shown with anode at left mounted in it. . . . Mold, the anode used for plating it, and a finished casting.

company, when we take into consideration the time that would be lost in making over dies and tools, repolishing molds, etc., with the attendant loss in production.

Solution and Equipment

During the course of the years we have been doing this kind of plating, we have gradually evolved a technique which we found would best produce the results we were seeking. We use a chrome bath containing 40-45 ounces per gallon of chromic acid and .55-.65 ounce per gallon of sulfate calculated as sulphuric acid, a ratio of approximately 70 to 1. The temperature of the bath is held at 135-140° F. The current density may vary from 100-4,000 amperes per square foot, depending on the kind of work being done. The cathode efficiency of this bath averages from 13-18% varying somewhat with the current density used.

If the sulphate content drops too low, gray deposits may be obtained at the high current densities desired. If the chromic acid drops much below 40 ounces per gallon, burned plate or peeling may be encountered.

For our work we must have a bath which can be used throughout a wide range of current density and still give bright, hard plate. It is our belief that chromium *plated bright* is hard chromium. However, not all bright chromium may necessarily be hard, because it may have been *plated dull* and polished bright.

Naturally it is to our advantage to plate at a higher temperature because, by so doing, we can use a higher current density and plate more chromium in a shorter time. This is essential for we often plate .030" or more and time is an important factor. So whenever the nature of the work permits, we plate with as high current density as the bright plating range will allow.

Armature which has received its stop-off application preparatory to building up the bearing surface on the bottom.

This is the main reason why we think it necessary to use a high chromic acid content. If we were to use a standard chromic acid content of 33 ounces per gallon with a 100 to 1 ratio between chromic acid and sulphate, we would not be able to plate at the high current densities we want, even at 135-140° F. because the solution would not "stand the gaff" and we would get burned plate. We use high values of chromic acid and sulphate which we believe results in better throwing power, and the ability to plate at high current density and obtain very bright, hard chromium.

The equipment required to do this kind of plating consists of the following:

1—Motor-generator set or rectifier units.
2—Chromium plating tank.
3—Cleaning equipment.
4—Control instruments:
  Voltmeters and ammeters
  Temperature control
  Rheostats.
5—Exhaust system.

1—The size of the motor-generator and the tanks will, of course, depend upon the amount of surface to be plated at any one time. Assuming that 1,000 amperes per square foot of surface be the maximum current density desired, the generator should be capable of delivering 1,000 amperes for each square foot of surface to be plated. The generator should have a voltage rating of at least 15 volts and be equipped with necessary rheostat control to vary the current between rather wide limits.

If only one tank is operated from the one generator, the most satisfactory arrangement is control by rheostat in the generator field. If more than one tank is used on one generator, a system of variable series resistances will have to be worked out so as to give suitable current variation from full load down to a few amperes.

2—The plating tanks are made of sheet steel and are lead-lined. Then for the best results the lead lining should be protected by sheets of glass covering the bottom and sides of the tank. These glass plates do not have to be sealed but should be cut carefully to size so that no large crevices exist at the adjoining edges of the plates.

Each plating tank should be equipped with two lead coils, one to carry steam and the other to carry cold water, in order to control the temperature of the solution. If a double valve is used, only one coil is necessary as the passage of steam or cold water can be controlled by the automatic temperature control of the meter. Some operators prefer to use heat exchangers and this process is quite satisfactory.

3—For cleaning the work prior to plating, if the surface is actually oily,

we wipe it off with a cloth wet with some suitable solvent such as trichlorethylene. Before starting the plating we use reverse current anodic treatment in a chromic acid solution. This treatment gives the work a slight etch which helps to produce a very adherent plate of chromium.

This etching may be carried out in the plating tank which may be provided with a reversing switch or, if more convenient, the work may be connected to the anode bars for the etching treatment. In our practice, the work is placed in the plating bath, allowed to come fully up to bath temperature (135-140° F.) and then a current of about 200-300 amp./sq. ft. of area to be plated, is applied to the work as anode. We leave this current on for a period which has to be determined more or less by experience, but which may vary from 15 or 20 seconds up to one minute according to the nature of the surface of the piece and the kind of steel of which it is made. At the conclusion of the etching treatment, plating is begun at once.

4—The control panel should carry for each plating tank a voltmeter, ammeter and temperature control instrument. In case the current is varied by control of generator field, the panel will also carry a field rheostat and a reversing switch. If current is varied by series resistances, the panel will carry a bank of knife switches to control the variation.

5—It is very essential that chromium plating tanks be well ventilated to carry away the fumes arising from the solution. An exhaust blower capable of removing about 300 cubic feet of air per minute per square foot of solution surface should be installed.

Plating Procedures

Obviously it is necessary to shield the surface of the part on which no plate is wanted and to leave exposed only the portion to be plated. Where the part is to be plated an hour or less and its shape lends itself to taping, we merely wrap rubber tape around it. Where the part is to be plated for several hours and we are not particular whether the plate creeps through the insulation in spots, we cover the portion to be unplated with an insulating lacquer. Where we want the best possible protection, we first lacquer, then tape, then lacquer over the tape.

Worn parts such as plug gages, arbors, etc., which are to be brought back to normal size, are first ground two or three thousandths undersize, plated up to two or three thousandths oversize and then ground down to the desired diameter.

Parts having deep recesses or holes through them which have to be plated, such as ring gages or other parts having a bore, molds for distributor caps, etc., must be plated with special inside anodes, since the throwing power of chromium is very poor.

In the case of ring gages or other parts having a bore, merely a straight rod made of lead and centered in the hole, is sufficient for sizes under one inch diameter. For one inch diameter and above, we use a lattice-work anode.

Molds having deep cavities and complicated shapes, such as the distributor cap mold, must have anodes of approximately the same shape as the finished casting, in order to insure perfect covering of the inside of the mold with chromium plate.

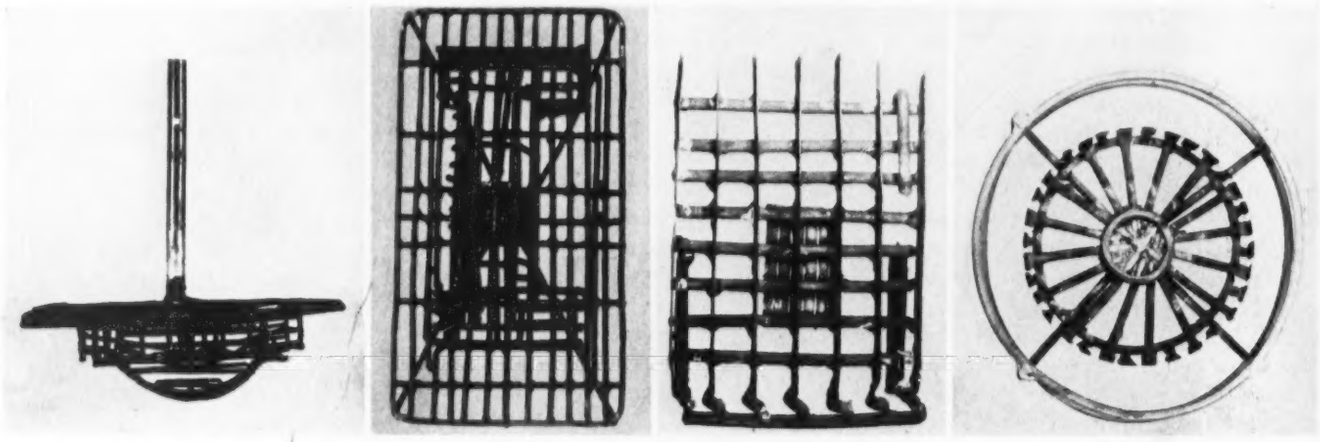
A long time ago we abandoned the use of shaped anodes fabricated from sheet lead and began to build up latticed anodes with lead or solder wires of various diameters. We find that thus we obtain much better conditions as to current distribution, withdrawal of hydrogen gas bubbles and flow of solution within the part being plated.

Drills and reamers used on molded plastic parts are usually ground .002″ or .003″ undersize then plated about .003″ oversize and ground down to size. These tools are so treated because plastic materials are very abrasive and soon wear them undersize, especially if they are not plated.

Drills, taps and reamers and other cutting tools, when plated for use on hard metals, are given only a thin coat of chromium, probably not over .0002″ or .0003″ thick and preferably not over .0001″, as a heavier plate would often chip under impact against metal.

Files are given only a light coat, not over .0001″ to .0002″, or just enough to make the cutting edges sharp. They are plated for only a short time but at a very high current density, around 1,000-4,000 amperes per square foot of plating surface. Chromium plated files will outlast unplated ones in the ratio of two or three to one. It is difficult to give any definite rule as to time of plating, for this will vary somewhat with the type of file, and the exact factors of time and current density have to be worked out by experience.

For instance, a needle file might be plated for only a few seconds at a current of about 4,000 amp./sq. ft., whereas a large flat file would probably be started at 300-400 amp./sq. ft. for a few seconds, then brought up to a high density (1,000-2000 amp./sq ft.) for



Reading from left to right: Side view of a latticed anode used for plating the female half of a rubber mold. . . . Bottom view of the same anode. . . . Examples of other forms of latticed anodes.

a total plating time of one to four minutes.

Typical Plating Cycles

A typical cycle for plating a new plug gage, for example, is as follows: The knurled handle is painted with lacquer for a distance of about one inch adjacent to the area to be plated. The gage is held vertically in the solution by means of a 50-ampere battery clip soldered to a brass rod. Usually the gages are plated at least ten or more at a time and at a rate of .002"-.004" on the diameter per hour at a current density of from 700-1,300 amp./sq. ft.

Place the parts in the etching bath, allow them to warm up to the temperature of the bath, then apply a reverse current of about 300 amp./sq. ft. for 15-20 seconds. Then apply normal plating polarity, starting at a current density of around 300 amp./sq. ft. and gradually increasing it in two or three steps at intervals of a few minutes, until at the end of a half-hour, the desired maximum density of about 1,000 amp./sq. ft. is attained. Maintain this current density until the required thickness of plate is obtained.

The gages which had previously been ground about .002" undersize are plated enough to give about .003" over the finish size at the upper end for grinding. The lower end builds up faster than the upper by about 30%.

If it is desired to replate gages which already have a good coat of chromium on them, do not bother to strip off the chromium, but treat them exactly as the new steel plugs were treated up to the reverse current treatment.

Use a current density of only about 200 amp./sq. ft. instead of 300 amp./sq. ft. Then when the plating is begun, start the current at a low value that will barely plate, increasing it in two or three steps at intervals of a few minutes, until at the end of a half-hour, the current density is about 300 amp./sq. ft. at which point maintain it for another half-hour, then raise it to the desired density and plate to the required thickness.

The inside of ring gages and of plastic or rubber molds is plated at a current density of about 800 amp./sq. ft.

A typical cycle for plating tools such as drills, reamers, taps, milling cutters, etc., for use on metals, would be the same as that for plug gages up to the point of actual plating. The plating time for plug gages, worn machine parts, etc., where several thousandths of an inch of plate are to be applied, is a matter of hours, depending on the amount of plate to be put on, but the time involved in plating cutting tools is measured in minutes or even fractions thereof.

As a rule, the current density used in plating cutting tools is higher than for plating plug gages, etc. As previously stated, the plate is only a flash coat of .0001-.0002" and is obtained by applying a high current density (1,000-4,000 amp./sq. ft.) for a very short time rarely exceeding one minute.

For putting a heavy plate on a flat surface, the current density should be such that not over .001" per hour is plated in the center of the piece. To prevent heavy build-up at the edges, a shield of thin metal cut out to fit snugly over the piece and to project about ⅛" beyond its edges, is slipped down about 1/16" below the face to be plated. These projecting edges take the excessive plate and allow the piece to build up uniformly.

The question of whether or not to give chromium plated parts a heat treatment to remove hydrogen embrittlement must be decided by each plater on a basis of what the circumstances demand.

Heat treatment of parts, especially thin ones, such as springs plated with zinc, cadmium, copper, etc., has long been standard practice. So far as our experience is concerned, we have never found it necessary to use a heat treatment on our chromium plated tools, dies or gages.

In the case of flash coats of .0001-.0002" such as those applied to tools for cutting metals, obviously, there would be no appreciable hydrogen embrittlement and, therefore, no necessity for heat treatment.

Even in cases where we use much heavier plate up to .002" or .003" on tools such as coining, heading or drawing dies which are subjected to impact, we do not heat treat and we almost never have any trouble with peeling or chipping of plate.

In these days of critical materials it is more than ever worthwhile to salvage production parts, especially those made from alloy steels hard to replace. For instance, a bearing surface on a shaft may have been ground too small. Not only valuable time has gone into this part, but the material is too costly to be just scrapped. It can be reclaimed at a cost not exceeding 10% of its value, by plating oversize with chromium and grinding to size. The part is then not only as good as new but even better than new, because the chromium plated area makes an ideal bearing surface. These shafts can be built up at the rate of from .004-.010" per hour on the diameter at a current density ranging from 1,000-2,000 amp./sq. ft.

An interesting fact is that some materials can be plated faster than others, apparently due to differences in chemical constituents. For instance, SAE 6140 steel, which is a chrome-vanadium alloy, can be plated at an average of only about 1,000 amp./sq. ft. producing .005" of plate per hour on the diameter, whereas SAE 2345, which is a nickel steel, can be plated at around 1,800 amp./sq. ft. and built up about .010" per hour on the diameter. In plating cast iron, especially down in slots, it is necessary to use two or three times as much current density as for other work. The anode must be very close, say 1/16" from the work, instead of about ¼" as for a similar job on steel. Cast iron is an exception to the general rule of starting plate at a low current density, for, if it does not start plating all over at once, it is very likely not to cover at all.

The grinding of chromium presents a somewhat different problem from grinding steel. The hard chromium is more easily ground with a softer, free-cutting wheel than might be used for grinding hardened tool steel. For this work we use the aluminum oxide type of abrasive in a wheel made up with a refined grade of oxide. The refined oxide has some of the impurities, such as iron oxide, removed and therefore it will not heat up so much under the stress of grinding the hard chromium. The wheels are made up with about 60 grain abrasive with a fairly open bond.

The operation of a chromium plating equipment for this kind of work may not be without its disappointments at first, until the operator acquires facility, for after all, success in this work is dependent largely upon the experience, skill and ingenuity of the operator. But time and money invested in attaining this success will, in the end, pay big dividends.

Annotated Bibliography of Aluminum Cleaning*

Prepared by JAY C. HARRIS[1] and ROBERT B. MEARS[2]

The preparation of this bibliography was undertaken to provide Section G on Metal Cleaners of Subcommittee II on Specifications of the A.S.T.M. Committee D-12 on Soaps and Other Detergents with information regarding existent specifications and methods for cleaning aluminum. Included is pertinent information dealing with the various types of commercial cleaning methods, means for inhibiting corrosion and descriptions of established laboratory techniques for the evaluation of detergents used for cleaning this metal.

(1) *Genie Civil*, Vol. 23, p. 375 (1893).

Taken from a reference in *Engineering and Mining Journal*. This article outlines several methods of aluminum cleaning, including grease removal with organic solvents, acid, and hand finishing. A varnish of turpentine and stearic acid, and a polish of bloodstone are used for polishing.

(2) Maurice de Keghel, "Products for the Maintenance and Cleaning of Metals and Their Manufacture," *Produits Chimie*, Vol. 25, pp. 327-333 (1922); *Journal*, Inst. Metals, Vol. 30, p. 660 (1923).

Processes for polishing and cleaning are divided into the following classes: (1) direct dry hard abrasion, (2) wet soft abrasion, and (3) dry soft abrasion.

(3) R. Seligman and P. Williams, "Cleaning of Aluminum Utensils," *Journal*, Inst. Metals, Vol. 28, pp. 297-298 (1922).

Danger of pitting aluminum while cleaning with soda solutions can be eliminated by adding enough sodium silicate to the soda solution to (*a*) combine with the calcium in the water used, and (*b*) to leave a slight excess of silicate to form a protective coating of colloidal aluminum silicate on the metal. 10 to 12 per cent silicate is required.

(4) "Cleaning and Polishing Aluminum," *Aluminium-Messing-und Kupfer-Waren*, Vol. 5, No. 12, p. 9 (1923); *Journal*, Inst. Metals, Vol. 30, p. 660 (1923).

To obtain a bright white surface the article is dipped for 15 sec. in a hot 10 per cent solution of NaOH saturated with NaCl, washed, dried, and polished. Again immersed in the same solution for about 30 sec. or until gas is evolved, washed, dried. If copper is present, a brown stain is found which is removed by immersion in concentrated nitric acid.

(5) B. Haas, "Preparation of Polishing Pastes for Aluminum," *Aluminium*, Vol 5, No. 8. pp. 7-10 (1923); *Journal*, Inst. Metals, Vol. 30, p. 660 (1923).

Methods and preparations for polishing.

(6) Rohrig, "Diminishing Attack of Alkali Solutions on Aluminum by the Addition of Water Glass," *Chemiker-Zeitung*, Vol. 47, pp. 528-529 (1923).

Describes in detail tests involving the use of water glass as a corrosion inhibitor in 0.05 per cent quantities at room temperature and at the boil in combination with caustic soda and soda ash. This amount seems to protect adequately with soda ash and with caustic soda at the same concentration.

(7) "Cleaning Aluminum," *Automotive Industry*, Vol. 50, February 14, 1924, p. 353.

It was found by Rohrig that the addition of one-half per cent of water glass to a soda solution reduced or eliminated the solvent action on aluminum.

Suggested by W. Ostwald that aluminum parts of the cooling systems of auto be rendered immune from the solvent action, by filling the system for the first time with weak soda solution containing water glass.

(8) E. M. Baker and R. Schneidewind, "Metal Cleaning with Alkaline Cleaning Solutions," *Transactions*, Am. Electrochemical Soc., Vol. 45, pp. 327-352 (1924); *Chemical Abstracts*, Vol. 18, p. 1439 (1924).

Efficiency of alkaline cleaning solutions determined by measuring the relative interfacial tensions of these solutions and water, and these solutions with a standard mineral oil. Measured industrial soaps, NaOH, trisodium phosphate, sodium carbonate and sodium silicate. According to these results sodium silicate is the most effective.

(9) T. S. Blair, "Prepared Metal Cleaners," *The Metal Industry* (New York), Vol. 22, pp. 488-489 (1924); *Journal*, Inst. Metals, Vol. 34, p. 665 (1925).

Emphasis upon proper cleaner and proper application to conserve time and money.

(10) William Blum and G. B. Hogaboom, "Principles of Electroplating and Electroforming," pp. 125-132, McGraw-Hill Book Co., New York, N. Y. (1924).

General information and some specific formulas for metal cleaning.

(11) H. A. Gardner, "Recent Observations Regarding the Corrosion, Cleansing, and Protection of Aluminum," *Mechanical Engineering*, Vol. 46, pp. 206-207 (1924).

Much is given on the causes of corrosion and protective measures. Aluminum fittings, castings, and motor parts oftentimes must be cleaned. Dipping in benzol gives effective results in many cases but danger is involved in handling such solvents. Combinations of caustic soda, borax and soda ash in hot water in 5 per cent solutions are more effective but may etch the aluminum. Addition of 2 to 3 per cent neutral soap paste to this liquid is proposed and this apparently aids in decreasing corrosive effect of the alkalies. The metal is placed in boiling baths for 5 to 30 min. and then rinsed by flushing. No data on embrittlement were obtained. Sodium silicate is useful in inhibiting attack. Suggests the use of 5 per cent NaOH or soda ash with the addition of not less than 0.5 per cent sodium silicate for cleansing aluminum parts. Addition of a small amount of soap paste might aid.

(12) W. L. Carver, "New Process Is Developed for Cleaning Metal Body Surfaces," *Automotive Industry*, Vol. 54, pp. 148-149 (1926); *Journal*, Inst. Metals, Vol. 39, p. 656 (1928).

Description of the application of a proprietary compound by spray gun method. The compound consists of sienna, powdered charcoal, methyl-ethyl ketone, and phosphoric acid. This mixture is sprayed upon the body surface and when it drops off the body is subjected to an alcohol bath. Leaves the surface clean and neutral with a slight etch.

(13) Jacob Hay, "Cleaning and Preparing of Metals for Enamel," *Monthly Review*, Am. Electroplaters' Soc., Vol. 13, No. 8, pp. 10-14 (1926); *Journal*, Inst. Metals, Vol. 41, p. 630 (1929).

Aluminum die castings should be cleaned with strong sodium hydroxide solution, rinsed in cold water, then dipped in a mixture of three parts of nitric acid and one part sulfuric acid, washed, dried and heated to 400° F. Zinc or galvanized metals should be cleaned first in a weakly alkaline solution, rinsed, and dipped in a solution of 1 lb. copper chloride, 1 lb. copper sulfate, 1 lb. ammonium chloride and 1 lb. hydrochloric acid in 6.4 gal. of water.

(14) "Testing of a Universal Cleaning Re-agent," *Jahresberichte*, Chemisch-Technische Reichsanstalt, Vol. 6, pp. 211-212 (1927); *Journal*, Inst. Metals, Vol. 41, p. 631 (1929).

A cleaning reagent comprising 33 per cent water, 56 per cent sodium bicarbonate, 10 per cent soft soap, and small amounts of sodium carbonate, glycerine and traces of iron and aluminum oxides has no harmful effect on aluminum.

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* *Reprinted from ASTM Bulletin, Jan. & Mar. 1943 by permission of American Soc. for Testing Materials.*

This paper also appears in the A.S.T.M. Standards on Soaps and Other Detergents, p. 107. (Issued as separate publication.)

There are several Armed Forces specifications which are pertinent to this bibliography, but these cannot be abstracted for reasons pertaining to national defense.

1. Chairman, Section G on Metal Cleaners, Subcommittee II on Specifications, Committee D-12 on Soaps and Other Detergents; Monsanto Chemical Co., Dayton, Ohio.

2. Metallurgical Division, Aluminum Research Laboratories, Aluminum Company of America, New Kensington, Pa.

(15) P. H. Groggins and Walter Scholl, "Ortho-dichlorbenzene—an Excellent Cleaner for Metals," *Industrial and Engineering Chemistry*, Vol. 19, pp. 1029-1030 (1927); *Chemical Abstracts*, Vol. 21, p. 3426 (1927).

Ortho-dichlorbenzene can be used unmodified or as a paste in five parts to one part of precipitated chalk. It acts as a solvent for oxides of nickel, silver, copper and aluminum, and has negligible action on the metals.

(16) Edgar T. Painton, "The Working of Aluminum", p. 210, Chapman & Hall, Ltd., London (1927); *Bulletin No.* 3, Mellon Intitute of Industrial Research. A Select, Annotated Bibliography of the Hygienic Aspects of Aluminum and Aluminum Utensils.

The dark film occasionally obtained upon boiling certain kinds of water in aluminum utensils is thought to be due to the small percentage of iron impurities in the metal acting in conjunction with the impurities in the water. This film may be removed by boiling with a dilute acetic acid solution or fruit juices.

(17) "Practical Industrial Metal Cleaning," *Black and White*, Vol. 1, No. 3, pp. 36-38; No. 4, pp. 28-30 (1928); *Journal*, Inst. Metals, Vol. 40, p. 702 (1928).

Discussion of the general technique in immersion cleaning of metal parts.

(18) D. J. Benoliel, "Growth of Industrial Cleaning. The History, Chemistry and Mechanism of Metal Cleaners," *The Metal Industry* (New York), Vol. 26, pp. 79-80, 121-123 (1928); *Journal*, Inst. Metals, Vol. 41, p. 630 (1929).

Lists the variety of cleaning jobs based upon the metals involved.

(19) G. E. Heron, "Cleaning Sheet Metal to Be Finished," *Industrial Finishing*, Vol. 4, pp. 107-108, 110 (1928); *Journal*, Inst. Metals, Vol. 40, p. 702 (1928).

Discussion of the troubles caused by improper cleaning and explains how to keep cleaning solutions and rinses in first class condition.

(20) "Tests on Aluminum Cleaning Methods," *Jahresberichte*, Chemisch-Technische Reichsanstalt, Vol. 8, pp. 182-183 (1929); *Journal*, Inst. Metals, Vol. 47, p. 235 (1931).

The addition of chromate or silicate to strongly alkaline cleansers of aluminum prevents corrosion.

(21) F. J. Gavin, "Cleaning Aluminum for Decorating Purposes," *Metal Cleaning and Finishing*, Vol. 1, No. 7, November, 1929, pp. 585-586.

Aluminum sheet is coated with oil for shipping purposes, hence, cannot be successfully decorated until cleaned. The average decorator can easily remove the oil by placing any good hydrocarbon thinner or turpentine substitute in the fountain of his coating machine. Apply a heavy coat of this to the composition roller, leave off the bottom scraper bar to permit the thinners to coat on the bottom of the plates and then pass the sheets through the automatic oven for 15 min. at 500 to 550° F., after which the metal will be found to be lithographically clean.

(22) O. F. Hunziker, W. A. Cordes, and B. H. Nissen, "Metals in Dairy Equipment —Corrosion Caused by Washing Powders, Chemical Sterilizers, and Refrigerating Brines," *Journal of Dairy Science*, Vol. 12, pp. 252-284 (1929).

Nineteen different metals, plated metals and metal alloys were tested. Aluminum and a manganese alloy of aluminum containing 1.25 per cent manganese were among those tested. The alkalies tested were a special alkali (35 per cent NaOH, 62 per cent Na_2CO_3), sodium carbonate, Wyandotte (49 per cent Na_2CO_3, 36 per cent $NaHCO_3$), trisodium phosphate, tin cleaner, Diversol and NaOH. Chemical sterilizers were sodium hypochlorite, Diversol, and Chloramine-T. The test comprised partial immersion of the metal strips in solutions in closed Mason jars for 5 hr. at 150° F. for alkalies and 5 days at 70° F. for chemical sterilizers. Used 0.5 per cent solutions of alkalies. Found that the addition of 0.025 per cent sodium chromate to 0.5 per cent solution of trisodium phosphate in water very greatly reduced corrosion. With 0.5 per cent solutions of alkalies the addition of sodium silicate in 0.05 per cent quantities did not reduce the attack of NaOH and trisodium phosphate but completely eliminated corrosion by soda ash. For tin coated equipment the use of trisodium phosphate solution (0.16 to 0.5 per cent) combined with 0.025 per cent sodium chromate is best.

(23) "Cleaning Method for Aluminum Castings," *Metallbörse*, Vol. 20, February, 1930, p. 428.

The following method is recommended for the removal of oil, dirt and finger marks from aluminum castings: The casting is placed in the usual hot (90°C.) alkaline cleaning solution until the surface begins to tarnish. It is then removed, washed in cold water and dried. The casting is then placed for a few seconds in a cold solution of a mixture of two parts concentrated nitric acid and one part concentrated sulfuric acid. It is then rinsed in cold water and then in boiling water. A small amount of borax soap (about 8 g. per liter) is generally added to the hot water bath in order to remove the last traces of acid and to prevent spotting and finger prints.

(24) "Preparation of Sheet Metal for Painting," *Bulletin No.* 16, Am. Chemical Paint Co., Ambler, Pa., 15 pp., August, 1930.

The whole paper is given over to the preparation of sheet metal preparatory to painting, and discusses the Deoxidine Process. Deoxidine is a cleaning liquid made up of phosphoric acid, wetting agents and other additions.

(25) "Removing Metal Scale," *Ceramic Industry*, Vol. 14, p. 552 (1930); *Journal*, Inst. Metals, Vol. 50, p. 578 (1932).

A method is described for electrochemical means for descaling while at the same time protecting the metal from hydrogen embrittlement, in which a metal is co-deposited upon the work when the scale is removed.

(26) "Sodium Metasilicate for Metal Cleaning," *Brass World*, Vol. 26, p. 248 (1930); *Journal*, Inst. Metals, Vol. 47, p. 50 (1931).

The superiority of sodium metasilicate for nearly all metal cleaning purposes is described.

(27) "Electrolytic Metal Cleaning Without Corrosion," *Chemical and Metallurgical Engineering*, Vol. 37, pp. 634-635 (1930); *Journal*, Inst. Metals, Vol. 47, p. 118 (1931).

The Bullard-Dunn electrolytic process in which a metal film is deposited on the metal to be cleaned the instant each particle of scale is removed. The film is a metal, resistant to the acid bath, such as lead, tin or zinc.

(28) W. F. Cahill, "Preparation of Metals for Finishing," *Monthly Review*, Am. Electroplaters' Soc., Vol. 17, No. 1, pp. 24-26 (1930); *Journal*, Inst. Metals, Vol. 43, p. 672 (1930).

Hints on the removal of grease and stains by means of the tumbling barrel and electrolytic cleaning baths.

(29) Julius Fischer, "Cleaning of Metal Parts—I. Dry Cleaning," *Werkssleitr.*, Vol. 4, pp. 53-55, 127-131 (1930); *Journal*, Inst. Metals, Vol. 47, iii, p. 50 (1931).

Mechanical methods of cleaning are discussed.

(30) M. Freyman, "Cleanser for Aluminum Vessels," *Petit Journal du Brasseur*, p. 774 (1930); *Brewing Trade Review*, Vol. 44, p. 452 (1930); *Journal*, Inst. Brewing, Vol. 36, p. 512 (1930); *Journal*, Inst. Metals, Vol. 47, March, 1931 p. 166.

Discusses the removal of beer scale from aluminum surfaces. Used washing soda and water glass. This treatment is not always successful. Prior to the use of the above treatment control corrosion tests were made in the laboratory.

(31) A. K. Graham, "Industrial Cleaning of Metal," *Monthly Review*, Am. Electroplaters' Soc., Vol. 17,, No. 1, pp. 4-10 (1930); *Journal*, Inst. Metals, Vol. 43, p. 672 (1930).

General discussion of metal cleaning.

(32) R. W. Mitchell, "Cleaning Aluminum," *The Metal Industry*, Vol. 28, pp. 171-172 (1930).

The amphoteric nature of aluminum is pointed out. Many aluminum alloys contain some metal electro-negative to aluminum such as copper, iron, or nickel. Segregation of these produces an opportunity for galvanic action which shows them up by pitting and hydrogen evolution. Alloys containing silicon also are subject to attack, as silicon and silicides dissolve readily in hot alkaline solutons.

Soluble silicates and chromates are useful for preventing corrosion. This effect is attributable to a thin layer of insoluble aluminum silicate in one case and the deposition of a similar thin layer of insoluble chromate in the other. Also, it is possible in the latter case that an insoluble chromite or chromic aluminate is formed.

In strongly alkaline solutions chromates are ineffective and it is said that their effect is retardant rather than inhibitive. On zinc and tin the chromates are more effective.

The amount and kind of silicate is important. The more alkaline ones do not protect well, and those too high in silica form a heavy, difficultly rinsable film. Such a deposit is unsightly and may result in alteration in the dimensions of machined parts.

A test is described which is useful in the evaluation of aluminum cleaners. Aluminum strips ¼ in. wide by 1 to 2 in. long are inserted in 6-in. calibrated test tubes which have been filled with the cleaner solution and inverted in the beaker containing the solution. For exact quantitative determination the metal strip is cleaned with benzene or ether, wiped and weighed. The strips are inserted in the test tubes and the beakers placed in a water or steam bath at 200° F. for a given period (15 min.). At the end of this period, the gas evolved is measured, the pieces removed, and rinsed in a standard manner and weighed.

A specification for a suitable material would read: Solution concentration of 2 to 6 per cent by weight should not evolve more than 2 cc. of gas nor dissolve more than one milligram of metal per square inch of surface at 200 to 210° F. The material should rinse freely and leave no visible deposit.

In aluminum cleaning, solutions should be maintained at not over 210° F. and preferably at 200° F.

This method may be applied to zinc and its alloys, such as die-casting metal, or magnesium alloys.

(33) R. W. Mitchell, "The Cleaning of Metal," *Metal Cleaning and Finishing*, Vol. 2, pp. 13-18, 111-114, 207-210, 299-304, 389-395, 485-493, 585-594, 598, 673-680, 684, 759-762 839-847, 935-945, 1025-1031 (1930).

Theoretical and practical discussion of the action of cleaning compounds; general explanation of alkalinity ranges and the colloidal ad buffer actions of cleaners. Colloidal action as applied to detergent processes. Properties of soap and other washing colloids. Surface tensions of various liquid solutions and colloidal solutions and their relation to detergent action. Interfacial tension. Adsorption and emulsification. Alkalinity and acidity. Buffer action. Measurement of cleaning action. Comparison of various detergents.

(34) E. G. Porst, "Metal Cleaning," *American Enameler*, Vol. 3, No. 6, p. 9, No. 7, p. 5 (1930); *Journal*, Inst. Metals, Vol. 50, p. 578 (1930).

The type of cleaner is determined by the kind of soil to be removed. Soil removal is divided into two steps: (1) wetting, (2) suspending. The actual dislodging is accomplished in one or more ways: 1) saponification, (2) dissolution, (3) chemical dissolution, (4) agitation, (5) colloidal action, and (6) heating.

(35) H. S. Rawdon, "Corrosion-Prevention Methods as Applied in Aircraft Construction," *Proceedings*, Am. Soc. Testing Mats., Vol. 30, Part II, p. 61 (1930); *Chemical Abstracts*, Vol. 25, p. 1786 (1931).

Bare aluminum surfaces are cleaned by the use of a mild etching solution such as a dilute solution of phosphoric acid. Another solution is a caustic "dip" followed by neutralization with weak acid. Mild abrasives may be used, even sandblasting for the heavier parts, each followed by chemical cleaning. Special precautions are to be taken against "crevice" corrosion involving the use of protective tape, etc.

(36) Frank P. Spruance, "Initial Cleaning and Preparation of Sheet Metal Surfaces of Bodies Are of Major Importance in Production," *Automotive Industry*, Vol. 62, pp. 374-376 (1930); *Journal*, Inst. Metals, Vol. 47, p. 680 (1931).

Metal cleaners should: (1) remove oil, grease and antisqueak compounds so that the entire surface can be acted upon, (2) remove rust and destroy rust removers, (3) remove alkalies and destroy their paint shedding action, and (4) produce a surface to which the prime coat will adhere tightly.

(37) Hermann Stadlinger, "Newer Methods for Cleaning Oily Metal Parts in Industrial and Technical Processes," *Chemiker-Zeitung*, Vol. 54, pp. 354-355 (1930); *Journal*, Inst. Metals, Vol. 47, p. 457 (1931); *Chemical Abstracts*, Vol. 24, p. 3578 (1930).

Various methods are described. A new cleaner, "P 3" sold in powder form by Henkel and Co., consists of a mixture of low alkali water glass and trisodium phosphate. Experiments show no corrosion of aluminum, zinc, etc. Also a special grade which does not attack tin plate, brass or duralumin is produced. In special metal washing machines 1 to 4 per cent solutions at 80 to 90° C. will serve, depending upon the kind of oil and dirt.

(38) James G. Vail, "Sodium Metasilicate: Its Place Among Industrial Alkalies," *Chemical and Metallurgical Engineering*, Vol. 37, pp. 736-740 (1930); *Transactions*, Am. Inst. Chemical Engrs., Vol. 25, p. 123-142 (1930); *Chemical Abstracts*, Vol. 25, p. 777 (1931).

Greasy aluminum jar caps were cleaned with 1 per cent boiling solutions of commercial alkalies for 5 min. The metasilicate produces a bright surface while corrosion was apparent with the others. Similar results were obtained even when solutions had the same Na_2O content. Corrosive action upon aluminum is said to be due at least in part to the anion involved.

(39) Tom L. Wheeler, Jr., "Industrial Cleaning," *Brass World*, Vol. 26, pp. 11-14 (1930) *Journal*, Inst. Metals, Vol. 43, p. 672 (1930).

General discussion.

(40) "'Metso'—a New Cleaner for Aluminum," *Aluminum Broadcast*, Vol. 3, No. 6. p. 20 (1931); *Journal*, Inst. Metals, Vol. 50, p. 706 (1932).

This is a proprietary form of sodium metasilicate. A 1 per cent solution in certain cases is said to clean aluminum without corrosion.

(41) "New Process of Metal Cleaning (Emulso Primer), *Metal Cleaning and Finishing*, Vol. 3, p. 921 (1931); *Journal*, Inst. Metals, Vol. 50, p. 707 (1932).

The Emulso primers are triethanolamine salts, useful for emulsion cleaning of aluminum.

(42) "Bullard - Dunn Electrochemical Cleaning Process," *Maschinenkonstrukteur*, Vol. 64, p. 111 (1931); *Journal*, Inst. Metals, Vol. 50, p. 768 (1932).

Descaling with hydrogen and the deposition of lead which affords protection for the metal against etching, pitting or hydrogen embrittlement. The process can be modified to remove oil or grease. It is claimed that no alteration of measurement takes place at the same time facilitating the determination of flaws. The lead coating may be used as an undercoat for subsequent plating.

(43) "Clean Metal Surfaces," *Oberflächentechnik*, Vol. 8, pp. 2-5 (1931); *Journal*, Inst. Metals, Vol. 50, p. 263 (1932).

Methods are described for cleaning and polishing of ferrous and nonferrous castings.

(44) A. Burg, "Degreasing and Cleaning Metal Parts," *Emailletechnik Monats Blätter*, Vol. 7, pp. 51-54 (1931); *Journal*, Inst. Metals, Vol. 50, p. 192 (1932).

In the preparation of metal pieces for enameling it is necessary to thoroughly degrease and clean the surface. The annealing process is used to burn off oil and grease or the surface is cleaned chemically by treating in baths of organic or inorganic solvents. The latter are divided into three classes: (1) solvents, (2) emulsifying agents, and (3) saponifying chemicals.

(45) E. J. Dobbs, "Theory of Metal Cleaning," *Journal*, Electrodepositors' Tech. Soc., Vol. 7, pp. 161-162 (1931-1932); *Journal*, Inst. Metals, Vol. 53, p. 216 (1933).

Wetting power, emulsifying and peptizing action are shown to be necessary functions of complex aqueous metal cleaning solutions. The constituents of the metal cleaner contributing each are discussed. The use of organic solvents especially in the vapor phase is reviewed. An etching process is described for cleaning steel and brass prior to electrodeposition.

(46) C. L. Mantell, "Composition and Uses of Heavy-Duty Metal Cleaners," *Metal Cleaning and Finishing*, Vol. 3, pp. 305-306 (1931); *Journal*, Inst. Metals, Vol. 50, p. 707 (1932).

An explanation is given for buffer action in cleaning operations.

(47) C. L. Mantell, "Alkali Solutions as Metal Cleaners," *Metal Cleaning and Finishing*, Vol. 3, pp. 641-645 (1931); *Journal*, Inst. Metals, Vol. 50, p. 505 (1932); *Chemical Abstracts*, Vol. 25, p. 5653 (1931).

Relation between pH, ionization, concentration and temperature of alkaline solutions containing NaOH, sodium carbonate, ammonia and their combination is outlined. It is shown that such solutions have definite limitations for cleaning purposes, their saponifying action being less important than supposed.

(48) C. L. Mantell, "Testing of Electrocleaners," *Metal Cleaning and Finishing*, Vol. 3, pp. 945-949 (1931).

An outline of methods for the determination of conductivity of cleaning solutions of various compositions.

(49) R. W. Mitchell, "Equipment for Cleaning Metal," *Metal Cleaning and Finishing*, Vol. 3, pp. 13-26, 107-115, 195-203, 287-294, 377-382, 463-466, 549-552, 631-634, 711-714, 793-796, 869-874, 953-957 (1931); Vol. 4, pp. 15-19, 71-78, 139-146, 207-214, 273-276, 333-338, 389-394, 445-450, 491-495, 541-545, 589-592, 637-642 (1931); Vol. 5, pp. 31-35 (1933).

Mainly a discussion of equipment. Other factors discussed are temperature in relation to cleaning operations, agitation as an aid to cleansing, importance of rinsing, theory and methods employed in electrolytic cleaning.

(50) R. W. Mitchell, "Maintenance and Life of Cleaning Solutions," *Monthly Review*, Am. Electroplaters' Soc., Vol. 18, No. 6, pp. 30-34 (1931); *Journal*, Inst. Metals, Vol. 50, p. 121 (1932).

A method is given for replenishing cleaning solutions.

(51) Floyd T. Taylor, "Bullard-Dunn Process of Cleaning," *Monthly Review*, Am. Electroplaters' Soc., Vol. 18, No. 8, pp. 17-22 (1931); *Journal*, Inst. Metals, Vol. 50, p. 121 (1932).

The process comprises electrolytic cleaning in sulfate-chloride electrolyte using lead anodes, whereby scale is removed and replaced with a lead film to prevent subsequent oxidation. The article so cleaned may be plated without removal of the lead film, or the film may be removed by a short anodic treatment in an alkaline bath.

(52) A. D. Weill, "Modern Practice in Metal Cleaning," *Journal*, Electro-depositors' Tech. Soc., Vol. 7, pp. 157-160 (1931-1932); *Journal*, Inst. Metals, Vol. 53, p. 216 (1933).

Aluminum cleaning is accomplished with aqueous solutions composed of mild alkalies such as phosphates and/or cyanides. Electrolytic cathodic cleaners may contain copper salts; incomplete deposition of the copper film indicating greasy patches. Suitable methods are given for cleaning stampings of brass, and similar metals, die-castings of zinc, aluminum and tin alloys, lead and pewter prior to electroplating.

(53) S. Wernick, "The Cleaning of Iron and Steel," *Journal*, Electrodepositors' Tech. Soc., Vol. 7, pp. 163-165 (1931-1932); *Journal*, Inst. Metals, Vol. 53, p. 216 (1933).

Methods for descaling, degreasing and electrocleaning steel prior to electroplating or other finishing are described. Discussion of the function of soap deliberately added or formed by saponification, together with rinsing properties, method providing visual evidence of completeness of grease removal, and the use of inhibitors in acid solutions to prevent overpickling.

(54) Leslie Wright and F. Taylor, "Modern Metal Cleaning," *Journal*, Electroplaters' and Depositors' Tech. Soc., Vol. 6, pp. 71-90 (1931); *Journal*, Inst. Metals, Vol. 47, p. 406 (1931).

Includes an historical introduction from the time of Berzelius to the present. The constitution of soap solutions and their physical properties are enumerated, and the mechanism of cleaning with special reference to the action of alkalies is discussed. Measurable values in the evaluation of alkalies are: (1) actual alkalinity (pH), (2) potential alkalinity denoting reserve, and (3) buffer value. Detergent actions described. Methods for measuring detergent action are outlined and the materials involved are discussed. Alkalies, together with soap constitute the best detergent, and factors determining the type of soap used in metal cleaning are cost, foaming, free rinsing, and solubility. Rosin soap (as against tallow) is highly satisfactory because of free rinsing. High pH causes tarnishing but this is minimized by the addition of inhibitors such as sodium silicate.

(55) "Cleaning Aluminum Tanks," *The Metal Industry* (New York), April, 1932, p. 146; August, 1932, p. 330. *Aluminium Broadcast*, Vol. 3, December 1, 1932, p. 17.

Difficulty in the proper pickling of aluminum tanks is outlined. Shows the need for control of the pickling bath and the subsequent rinse.

(56) "Aluminum Cleaner," *The Metal Industry* (New York), Vol. 30, June, 1932, p. 249.

The proprietary product "Houghto-Clean" for aluminum cleaning is described. Said to be designed for each special type of application.

(57) "Cleaning Aluminum," *American Machinist*, European Edition, Vol. 76, p. 973 (1932); *Journal*, Inst. Metals, Vol. 53, p. 52 (1933).

Types of solutions most suitable for aluminum cleaning are: (1) volatile solvents, (2) aqueous solutions of soap and mild alkalies, and (3) "water soluble controlled alkali" solutions. The make-up and method of using these solutions are described. A matt finish is produced by dipping the work in a solution containing 5 gal. nitric acid, 1 gal. hydrofluoric acid, 1 qt. sulfuric acid, or eight parts nitric acid and one part hydrofluoric acid.

(58) "Cleaning Metal Parts," *Industrial Finishing*, Vol. 10, No. 1, November, 1933, p. 9.

A description of wet cleaning of metals with naphtha or chemical solutions applied by hand dipping or by automatic dipping or spraying as the material is mechanically conveyed to and from the cleaning, rinsing and drying stations.

(59) "Cleaning Products for Brewing Vats," *Aluminum Limited Abstract Bulletin* 4, March 15, 1933, p. 15.

A study of the action, on aluminum, of special products intended to retard corrosion, which are added to the cleaning products used to dissolve the tartar of brewery vats and vessels. A number of proprietary German products are listed. Very satisfactory results were obtained with sulfonated acids.

(60) L. E. Frost, "Paint Metal Products," *Industrial Finishing*, Vol. 10, No. 1, November, 1933, p. 19.

Methods are given for the removal of grease and dirt with petroleum products such as benzene or gasoline; with lacquer thinner or toluol; or with a cleaning compound dissolved in water, all preparatory to painting.

(61) J. Geschelin, "Metal Cleaning, Methods and Materials," *Automotive Industry*, Vol. 68, pp. 466-470, 522-526, 702-703 (1933); *Journal*, Inst. Metals, Vol. 53, p. 584 (1933).

Aluminum is best cleaned by the use of a mild alkaline cleaner or solvent, then rinsed in clear, cold water. The surface is then made uniformly active by dipping for from 5 to 30 sec. in a solution of one part 50 per cent HF with nine parts water. In the case where an acid dip is to follow, the preliminary dip is eliminated. The surface is then roughened by etching, rinsed in clear cold water and then transferred to the plating bath. Care must be taken in the selection of the alkaline cleaner, and it is recommended that equal quantities of sodium carbonate and trisodium phosphate be added in 1 to 3 oz. quantities to 1 gal. of water at 180 to 200° F. Such a mixture attacks the metal mildly in the same manner as an electrolytic cleaning.

Quotes the New Jersey Zinc Co. recommendations for zinc cleaning.

(62) "A Select, Annotated Bibliography on the Hygienic Aspects of Aluminum and Aluminum Utensils," *Bulletin No.* 3, Mellon Inst. of Industrial Research, 69 pp., 150 references (1933).

(63) E. B. Sanigar, "Specifications for Chemicals and in Cleaning Metals," *Monthly Review*, Am. Electroplaters' Soc., Vol. 20, No. 3, pp. 26-29 (1933); *Journal*, Inst. Metals, Vol. 1, p. 207 (1934).

Chemical specifications are given for sodium hydroxide, sodium carbonate, sodium silicate, trisodium phosphate, potassium hydroxide, potassium carbonate, trichlorethylene, and carbontetrachloride.

(64) E. K. Strachen, "Composition and Action of Metal Cleaners," *Metal Cleaning and Finishing*, Vol. 6, pp. 426-429 (1933); *Journal*, Inst. Metals, Vol. 1, p. 207 (1934).

A practical discussion. General formulas are given.

(65) C. J. S. Warrington, "Modern Methods of Cleaning Metals," *Canadian Chemistry and Metallurgy*, Vol. 17, pp. 77-78 (1933); *Journal*, Inst. Metals, Vol. 53, p. 668 (1933).

A description of pickling methods is given.

(66) "Cleaning of Aluminum Appliances," *Aluminum*, Vol. 17, pp. 34-36 (1934); *Aluminum Limited Abstract Bulletin* 6, December 15, 1934, p. 6.

A list of the cleaning products which are available in Germany and which are suitable for the general cleaning of aluminum, as well as for the cleaning of brushed and highly polished aluminum surfaces.

(67) M. Chaussain and H. Fournier, "Chemical Methods of Cleaning Corroded Light Metals," *Comptes Rendus*, Vol. 198, pp. 936-939 (1934); *Journal*, Inst. Metals, Vol. 1, p. 240 (1934); *Chemical Abstracts*, Vol. 28, p. 3368 (1934).

(NOTE—The remainder of this Bibliography, references 68 to 127, will appear in the July issue of Metal Finishing).

THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING'S Washington Correspondent

Baltimore-Washington AES Branch Meeting

Samuel R. Warnock presided at the final 1942-1943 season meeting of the Baltimore-Washington Branch of the American Electroplaters' Society which was addressed by W. B. Stoddard, Jr., after the annual election of new officers for the branch and delegates to the AES Convention in Buffalo. About one-third of the Branch membership turned out, including William W. McCord, Charles A. Rice, and John J. Bognar as a triumvirate from the WPB, to sweep into office without a dissenting vote, the new officers for 1943-1944.

New Baltimore-Washington Officers

Because of the splendid work they did last year Samuel R. Warnock of the Navy Yard was re-elected president, and Dr. Vernon A. Lamb of the National Bureau of Standards was re-elected librarian. In re-electing Dr. Abner Brenner of the National Bureau of Standards as secretary and treasurer, the members not only expressed complete satisfaction with his past efforts, but they also expressed the feeling that he might need the huge annual salary of eight dollars. Kenneth M. Houston of the Western Electric Company of Baltimore, who was not present at the meeting to give his consent or to defend himself, was unanimously nominated and elected vice-president of the branch. The newly elected Board of Managers consists of Irvin H. Hahn of Baltimore, Lindell L. Turner of Washington, and Curtis S. Beetham of Baltimore. The delegates elected to attend the AES convention at Buffalo are Samuel R. Warnock, Thomas F. Slattery, and Kenneth M. Houston.

George B. Hogaboom, Sr. Resigns

George B. Hogaboom, Sr., who has spent fifty-five years of his life in the plating business and who is known throughout the industry for his alert, keen mind on plating subjects, has resigned as Principal Electroplating Consultant of the WPB's Conservation and Substitution Division. Mr. Hogaboom was quite ill for about a month this spring. After serving well his country for about one and one-half years, he has returned to New Britain, Conn., where he plans to continue maintaining his interest in plating and take life easy. Howard Coonley, Director of the Conservation Division, has requested Mr. Hogaboom, who was also a consultant for the government during the first World War, to serve as a special consultant on electroplating problems and investigations. Being a person who has always been active of mind and body, and who is still very much on his toes his legion of friends do not think he can "just retire."

Kenneth Graham Deputy Chief

About the first of May the Conservation Division of the WPB was divided into two primary branches—Materials and Products. This reorganization, according to Howard Coonley, Division Director, does not change the functions of the Division, which cover materials substitution, product specifications, and product simplification. In this new setup Harvey A. Anderson is Deputy Director of the Division; C. L. Warwick is Chief of the Materials Branch; R. B. Shephard is Chief of the Products Branch, and Dr. A. Kenneth Graham, who was formerly Chief of the Non-Metallic Section and Head Industrial Specialist on Plating and Finishing, is now Deputy Chief of the Products Branch and Head Industrial Specialist on Plating and Finishing.

The Nation's Economic Trends

According to official Washington data, the nation's unemployment has been reduced from 10,000,000 in 1939 to 1,000,000 in March 1943. Wage payments to employees are expected to continue to rise because of the lengthening of the work-week and because of further shifts from the lower paid non-essential jobs to higher paid essential ones. When 1929 is compared with February and March of 1943, the official index numbers indicate an increase of 95 per cent in industrial production, a 64 per cent increase in factory employment, a 188 per cent increase in factory payrolls, a 156 per cent increase in income of industrial workers, and a 10 per cent increase in wholesale prices of all commodities. The cost of living is one per cent below the 1929 level. The fluctuations for the period 1929-1943 may be gleaned from the accompanying table of index numbers which were compiled from the latest available official sources.

Index Numbers: 1935-1939 Base Period = 100

Year	*Industrial Production*	*Factory Employment*	*Factory Pay Rolls*	*Income of industrial Workers*	*Wholesale Prices of all Commodities*	*Cost of Living—Urban*
1929	110	108	127	134	118	122
1930	91	94	103	110	107	119
1931	75	80	78	84	91	109
1932	58	68	54	58	80	98
1933	69	75	58	61	82	92
1934	75	88	74	76	93	96
1935	87	93	86	86	99	98
1936	103	101	99	100	100	99
1937	113	111	118	117	107	103
1938	89	93	91	91	98	101
1939	108	102	106	105	96	99
1940	123	110	122	119	98	100
1941	156	135	178	169	108	105
1942	181	155	258	238	123	116
1943						
Jan.	199	171	322	291	126	121
Feb.	203	172	315	286	127	121
Mar.	205	—	—	—	128	—

Aluminum Price Schedule Terminates

On June 30, 1943, the WPB will terminate its established schedule of prices paid for idle aluminum. Beginning July 1, 1943, it will direct such material into normal scrap channels. Owners of aluminum which became idle as a result of WPB conservation orders and is still unreported to the WPB, will come under the existing higher-than-scrap price schedule if they report their inventories to the WPB Redistribution Division before June 30, 1943.

Copper and Zinc Restrictions Increased

The WPB is determined to attain further savings in such critical materials as copper, copper base alloy and zinc used in the manufacture of plumbing fixture fittings and trim. With this in mind, the WPB issued on May 6, 1943, an amended schedule V of Limitation Order L-42. This amended schedule, a consolidation of the original Schedule V and Schedule V-a, provides that no copper or copper base alloy shall be used in the making of plumbing fittings and trim except for limited amounts in 24 items specified in List A. *Other than for coating, no zinc is to be used except for items specified in List B.*

Electric Generator Restrictions Amended

The WPB has made a number of changes in controlling the production and delivery of electric motors and generators by amending on April 22, 1943, General Limitation Order L-221. The amended order excludes from its definition of electric generators certain high powered generators which are under the control of the WPB's Power Division. Only minor changes were made in the previously existing restriction of the types and designs of motors and generators that may be delivered. The restrictions have been eased to bring out of hiding used motors or generators. Certification submitted by dealers has been simplified.

Enameled Utensil Exemption

The manufacturing of enameled kitchen and household utensils for export may now be exempted from the simplification provisions of Supplementary Limited Order L-30-b, according to the amended order issued on May 3, 1943. Applications for authorization should be filed on Form PD-556. To bring this order in line with Priorities Regulation No. 16, appeals from this order should be made on Form PD-500.

Jewelry Polishing Restriction Removed

Two changes were made in General Limitation Order No. L-45, as amended May 6, 1943. The amended order makes it clear that mere polishing of jewelry is not subject to the restrictions of the order. Such operation does not affect their gold and palladium quotas. The other change concerns the amount of palladium which may be used in lieu of platinum during the quarter beginning July 1, 1943. Instead of allowing palladium up to 6⅞ per cent by weight of the platinum consumed in the base period, the allowance is now 7 per cent.

Nickel Plating Period Extended

The WPB eased the restrictions on the use of aluminum, copper and nickel in the manufacture of safety equipment by amending General Limitation Order L-114 on May 5, 1943. For example, copper or copper base alloys (other than nickel silver) may now be used for eyelets having a diameter of 1/16 inch or less where steel eyelets cannot be used; the period during which *nickel plating* may be used for spectacle-type goggles has been extended from May 31 to November 30, 1943; *nickel plating* may be used for specific parts of oxygen breathing apparatus, inhalators and hose masks where necessary for effective functioning, and the use of aluminum in machine guards is permitted where a less scarce material is not practicable.

PR Order P-89 Amended

Preference Rating Order P-89, which governs maintenance, repair and operating supplies for producers of chemicals and allied products, was amended on April 24, 1943, to bring it in complete conformity with CMP policies. But in spite of this it should be remembered that this order provides that no producer of these products is subject to the provisions of CMP 5 and 5A nor shall he obtain any material under the provisions of those regulations. According to this amended order, application for a serial number is now made by letter to the Chemicals Division, instead of on Form PD-315. The letter of application for a quarterly quota of maintenance, repair and operating supplies must, however, be accompanied by Form PD-762.

Selective Service Report Wanted

The War Manpower Commission announced on May 6, 1943, that employers in war or essential production should file with the Selective Service local boards written evidence of their employment of registrants who maintain bona fide homes with children less than 18 years of age, born on or before September 14, 1942. Selective Service Form No. 42B should be secured from the local board for this purpose. This is the first step in establishing the essentiality of an employee.

1943 Silver Production Outlook

Richard J. Lund, Director of the WPB Miscellaneous Minerals Division, in testifying before the Senate Banking and Currency Committee April 28, 1943, revealed that the estimated industrial consumption of silver in 1942 amounted to about 48,000,000 ounces for essential uses and about 73,000,000 ounces for non-essential uses. He estimated that in 1943 the silver consumption for essential uses will rise to 139,000,000 ounces and fall to 30,000,000 ounces for non-essential uses. These estimates he said do not include the potential demand for an additional 40,000,000 to 50,000,000 ounces. "In addition," he testified, "there are substantial foreign requirements for coinage and industrial use, estimates of which are necessarily difficult to secure but indications point at present to a total of 40 to 50 million ounces. Total requirements for 1943 would appear, therefore, to be a minimum of 210,000,000 ounces with a potential of 260,000,000 ounces." He also pointed out that the demand for foreign silver would be greater since production in the United States would be lower because of "(1) manpower shortages; (2) closing of gold mines which produced silver aggregating substantial amounts, and (3) closing of the Presidio Mine in Texas."

Smaller War Plants Separation Agreement

A lot of the small platers will be interested to learn that the separation terms of the Smaller War Plants Division from the War Production Board were agreed upon on May 4, 1943. The WPB will center its activities on production and servicing in all its phases, while the Smaller War Plants Corporation will concentrate its activities on the location of distressed plants and the procurement of business for smaller plants and business concerns. But in spite of this separation, because of the many inter-related activities, the field staffs of both organizations will be located in the same building. It was also agreed upon that the WPB and the Smaller War Plants Corporation will jointly review applications for new facilities, including machine tools, to insure the maximum utilization of existing facilites and machine tools through subcontracting.

Sulfamic Acid Forms Reduced

It is now only necessary to use Form PD-602 for authorization to deliver sulfamic acid and its derivatives which are used in *electroplating solutions*, according to General Preference Order M-242, as amended May 7, 1943. To lessen paper-work, Forms PD-600 and PD-601 were eliminated. A producer requiring permission to use a part or all of his own production of sulfamic acid and its derivatives must list his own name as customer on Form P-D-602, specifying the quantity required and the product used.

Sulfuric Acid Price Regulation Coming

During the month of May several meetings of sulfuric acid producers were held in Washington and other cities under the auspices of the OPA for the purpose of formulating a maximum price regulation on this vital industrial chemical. Edward W. Furst, formerly general manager of the Grasselli Chemicals department of E. I. duPont de Nemours, was appointed an OPA consultant during the period of formulating the regulation. Joseph D. Coppock, OPA's price executive of the Drugs and Chemicals Branch, presided at the meetings.

New Zinc Director Appointed

Howard I. Young, director of the WPB Minerals Bureau recently announced the appointment of James Douglas, a consulting engineer, as the new director of the Zinc Division to succeed George C. Heikes who resigned to join the staff of the Olin Corporation of Tacoma, Washington. Mr. Young also announced the appointment of Platt C. Benedict, a geologist as Deputy Director of the Zinc Division to succeed Walter C. Page who left the WPB to accept the position of assistant to F. S. Mullock, vice president and general manager of the United States Smelting, Refining and Mining Company of Salt Lake City, Utah.

POSSIBLE SUBSTITUTES FOR METAL FINISHING MATERIALS

The Conservation Division of the WPB has sought and is still seeking, possible substitutes to meet the demand for critical materials. Based on its findings and records, a compilation of materials, their restricting conservation order numbers and possible metal finishing substitutes according to Product Groups is presented here.

Product Group	*Restricting Conservation Order Number*	*Material*	*Possible Substitutes*
Abrasives	M-109	Rough Diamonds	Tungsten Carbide
Agricultural & Gardening Machy & Equip., except tractors	M-65	Cadmium	Enamel; Lead Base Paints
"	M-9	Copper	Porcelain; Enamel
"	M-11	Zinc	Paints
Aircraft & Accessories	M-66	Cashew Nut Shell Oil	Phenol; Cresylic Acids
"	M-6	Nickel	Paint; Enamel
Automobiles	M-65	Cadmium	Zinc Plating for Corrosion; Lead for Bearings; Lacquer or Enamel for Decorative Plating
"	M-9	Copper	Enameled Steel Tubing; Zinc Plating
"	M-15	Rubber	Enameled Steel
"	M-106	Shellac	Insulating Varnish
Beauty & Barber Shop Equip. & Products	M-6	Nickel	Paint; Lacquer; Enamel; Cadmium Plating
"	M-11	Zinc	Paint
Building Board & Insulation	M-11	Zinc	Sherardized Protective Coating
Cans & Other Metal Containers	M-1	Aluminum	Coated Steel; Coated Lead Foil
"	M-65	Cadmium	Enamels; Oleoresins & Lacquers for Coatings
Chemical Products	M-171	Chlorate Chemicals	Potassium Permanganate; Hydrogen Peroxide; Potassium Bichromate
"	M-41	Chlorinated Hydrocarbon Solvents	Petroleum Solvents alone or with Ester, Ketones or Alcohol; Emulsion Cleaners; Alkali Cleaners
"	M-19	Chlorine	Calcium Hypochlorite
"	M-9	Copper	Chrome; Ochre; Sienna Pigments
"	M-58	Glycerine	Ethylene Glycol; Invert Sugar; Dextrose
"	M-169	Methyl Ethyl Ketone	Acetone; Isopropyl Ether; Ethyl Acetate plus Isopropyl Acetate
"	M-77	Rapeseed Oil	Brown Peanut Oil; Brown Corn Oil; Lard Oil
"	M-257	Sulfuric acid	Hydrochloric or other acids under some conditions
"	M-57	Tung oil	Modified Fish Oils; Processed Linseed Oils
"	M-10	Vinyl polymers	Cellulose Acetate; Coumarine Resins
Construction & Mining Equipment	M-6	Nickel	Paint; Enamel; Silver; Chromium, Zinc or Bonderized Coatings
Construction, Wartime	M-65	Cadmium	Organic Paints
"	M-18	Chromium	Galvanized Steel
"	M-9	Copper	Steel; Lead Vitreous Enamelled
"	M-56	Natural resins	Limed Rosin; Oil Paints
"	M-6	Nickel	Paint; Enamel
"	M-62	Sodium nitrate	Salt Cake
"	M-11	Zinc	Paint
Containers & Packing Materials	M-9	Copper	Galvanized Steel
Cutlery & Flatware	M-9	Copper	Domestic Silver
"	M-126	Iron & Steel	Domestic Silver
"	M-6	Nickel	Moly Black and Chrome Plating; Silver Plating
Electric Lamps	M-65	Cadmium	Paints; Enamel, etc for Reflectors
"	M-11	Zinc	Organic Coatings
Electric Motors	M-65	Cadmium	Galvanized Parts; Black Japan; Paint; Enamels; Organic Coatings
"	M-6	Nickel	Paint; Organic Coatings; Enamels
Electrical Apparatus & Appliances	M-6	Nickel	Porcelain; Enamel; Paints; Organic Coatings
"	M-106	Shellac	Insulating Varnish
"	M-11	Zinc	Organic Coatings
Electrical Generating & Distributing Equipment	M-106	Shellac	Insulating Varnish
"	M-11	Zinc	Paint; Organic Coatings
Electromedical Apparatus	M-6	Nickel	Paint; Porcelain; Enamel; High-Baked Organic Coatings
"	M-11	Zinc	Organic Coatings

Product Group	*Restricting Conservation Order Number*	*Material*	*Possible Substitutes*
Elevators, Escalators & Conveyors	M-6	Nickel	Paint; Enamel
"	M-11	Zinc	Organic Coatings
Engines, Internal Combustion, including Diesels	M-6	Nickel	Paint; Enamel; Zinc Plating
"	M-21	Steel	Galvanized Steel
"	M-11	Zinc	Organic Coatings
Furnace & Associated Heating Apparatus	M-9	Copper	Galvanized Steel
"	M-6	Nickel	Paint; Enamel; Porcelain
"	M-11	Zinc	Organic Coatings
Furniture & Fixtures	M-65	Cadmium	Organic Finishes
"	M-11	Zinc	Organic Coatings
Hardware	M-65	Cadmium	Paint; Enamel
"	M-126	Iron & Steel	Paint; Enamel
"	M-11	Zinc	Paint; Enamel
Household & Service Machy.	M-6	Nickel	Zinc Coating; Enamel; Porcelain
"	M-11	Zinc	Organic Coatings
Jewelry, Timepieces, & Hollow-ware	M-1	Aluminum	Domestic Silver; Gold
"	M-112	Antimony	Domestic Silver
"	M-65	Cadmium	Domestic Silver; Lacquer; Enamel
"	M-9	Copper	Domestic Silver
"	M-49	Iridium	Palladium
"	M-126	Iron & Steel	Domestic Silver
"	M-6	Nickel	Domestic Silver; Enamel
"	M-162	Platinum	Domestic Silver; Gold; Palladium
"	M-95	Rhodium	Palladium
"	M-199	Foreign silver	Domestic Silver; Gold
"	M-43	Tin	Lead; Domestic Silver
"	M-11	Zinc	Domestic Silver; Gold
Kitchen, Household, & Similar Goods	M-1	Aluminum	Porcelain Enamel
"	M-65	Cadmium	Domestic Silver
Lighting Fixtures	M-65	Cadmium	Paint; Galvanized Iron
"	M-9	Copper	Silver
Luggage & Smallware	M-1	Aluminum	Silver; Gold
"	M-65	Cadmium	Enamel; Lacquer
Machine Tools	M-6	Nickel	Paint; Enamel
"	M-11	Zinc	Organic Coatings
Machinery, Consumers' Goods	M-65	Cadmium	Hot-dip Zinc; Sherardized Zinc; Electroplated Zinc; Paint; Enamel
"	M-21	Steel	Porcelain; Enamel
"	M-43	Tin	Porcelain Enamel; Paint; Organic Finishes
Machinery, Producer & Intermediate Goods	M-1	Aluminum	Secondary Brass; Zinc; Antimonial Lead
"	M-9	Copper	Plated Steel
"	M-6	Nickel	Silver, Chromium, Zinc or Bonderized Coatings; Paint; Enamel
Mechanical Power Transmission Equipment	M-11	Zinc	Organic Coatings
Metal Forming Machines	M-11	Zinc	Organic Coatings
Mortician's Goods	M-65	Cadmium	Clear Lacquer
Motor Vehicles, Special & Industrial	M-65	Cadmium	Zinc Plating; Lacquer; Enamel
"	M-66	Cashew Nut Shell Oil	Phenol; Cresol
"	M-9	Copper	Zinc Plating; Lacquer; Enamel
"	M-6	Nickel	Paint; Organic Finish; Enamel
"	M-15	Rubber	Enameled Steel
Motorcycles & Bicycles	M-65	Cadmium	Zinc Plating; Paint; Enamel
"	M-9	Copper	Zinc Plating
"	M-6	Nickel	Paints for coatings
"	M-11	Zinc	Paints for coatings
Musical Instruments	M-6	Nickel	Silver Plating
"	M-199	Foreign Silver	Domestic Silver
"	M-11	Zinc	Organic Coatings; Lead

(To be concluded next month)

Patents

Plating on Aluminum

U. S. Pat. 2,311,623. E. V. Blackmun and M. R. Mikula, assignors to Aluminum Co. of America, Feb. 23, 1943. In the method of treating an aluminum surface preparatory to applying an adherent coating thereon which comprises treating the aluminum surface in an alkali metal carbonate-chromate aqueous solution to produce a substantial oxide coating on the surface, and thereafter removing the oxide coating with an aqueous solution of an acid; the inclusion in the first mentioned solution of an alkali metal chlorate.

Example:

	Parts by Weight
Sodium carbonate	35
Sodium bicarbonate	8
Sodium chromate	14
Potassium chlorate	20
Water	1000

Temp. = 205°F. Time. = 5 min.

After treating in the above solution, the article is immersed in a solution containing 50% nitric acid to remove the oxide coating from the previous treatment. After rinsing, a coating is applied in the usual manner.

Hot Galvanizing Flux

U. S. Pat. 2,311,669. R. J. Kepfer, assignor to E. I. duPont de Nemours & Co., Feb. 23, 1943. A prepared foaming flux composition for use on a bath of molten metal comprising a chloride flux selected from the group consisting of zinc chloride, ammonium chloride, and zinc ammonium chloride and an isoamketaldoresin as a foaming agent.

Bright Nickel Plating

U. S. Pat. 2,312,097. R. O. Hull & C. F. Ruebensaal, assignors to E. I. duPont de Nemours & Co., Feb. 23, 1943. An acidic nickel plating bath including about 250 grams per liter of nickel sulfate, 15 grams per liter of nickel chloride, 35 grams per liter of boric acid, about 1 to 5 grams per liter of sulfite cellulose waste, and about 1 to 3 grams per liter of an addition agent selected from the group consisting of methyl naphthalene monosulfonic acid and its salts.

Example:

Nickel sulfate	250 g./L.
Nickel chloride	15 " "
Boric acid	35 " "
Sulfite cellulose waste	2 " "
Methyl naphthalene nickel monosulfonate	1.5 " "

Temp. = 50°C. pH = 5 electrometric
Current Density = 5-75 amp./sq. ft.

Coloring Stainless Steel

U. S. Pat. 2,312,066. C. Batcheller, Feb. 23, 1943. The method of hardening the surface of a corrosion-resisting alloy steel containing at least 6%, by weight, of chromium and increasing its resistance to corrosion and abrasion which comprises forming in said surface a thin film of dark color comprising hydrated oxides of iron and chromium by treating the steel in a solution of sulphuric acid, water and an etching-inhibiting-oxidizing agent selected from the group of acids consisting of chromic, vanadic, metavanadic, manganic and permanganic, drying said film and thereafter dehydrating said oxides by heating the steel to a temperature of the order of 800° to 1700°F., and cooling, to harden said surface and increase its resistance to abrasion.

Example:

	Parts by Weight
Etching-inhibiting-oxidizing agent	10-14
Sulfuric acid	36-50
Water	40-50

Temp. = 180-210°F. Time = 15-20 min.

The articles should be removed from this bath as soon as they are black.

Tarnish Prevention of Tin

U. S. Pat. 2,312,076. W. O. Cook & H. E. Romine, assignors to Carnegie-Illinois Steel Corp., Feb. 23, 1943. The method of forming a protective film upon tinned container stock, consisting in anodically treating said stock for not more than six seconds in an aqueous alkaline electrolyte at a current density sufficient to cause nascent oxygen to be deposited on the tinned surface and thereby forming a continuous oxide film on said tinned surface solely by said anodic treatment, said electrolyte being incapable of chemically attacking the tinned surface during said treatment, said film being of sufficient thickness that containers made from said stock are not discolored after or during the processing of sulphur-bearing food-stuffs therein.

Example:

Trisodium phosphate	150 g.
Soda ash	50 "
Caustic soda	20 "
Water	1 L.

The article is made anode in the above solution for 3-6 seconds at about 25 amp./sq. ft. with the temperature ranging from room to boiling.

Ductile Nickel Bath

U. S. Pat. 2,312,517. E. M. Baker, assignor to Houdaille-Hershey Corp., Mar. 2, 1943. The method of obtaining directly a soft, ductile nickel plate of image reflective ability that may be readily buffed to produce a mirror-like surface, which comprises electrolyzing a solution having a pH between 5.5 and 2.5 and containing, as essential active ingredients, nickel plating salts consisting of a mixture of nickel chloride and nickel sulphate, between 0.05 and 0.5 g./L. of lead, and sodium formate as a carrier for maintaining said lead in solution.

Example:

Nickel sulfate	240-300 g./L.
Nickel chloride	35- 50 " "
Sodium formate	25- 40 " "
Boric acid	25- 40 " "

pH = 3.6-4.0 Temp. = 135-145°F.
Current Density = 40-60 amp./sq.ft.

Use nickel anodes with a supplementary lead anode which should pass about 0.1% of the total current.

Vitreous Enamel

U. S. Pat. 2,312,788. R. Andrews & R. J. King, assignors to B. F. Drakenfeld & Co., Inc., Mar 2, 1943. A homogeneous enamel flux for glass melting around 1100°F. having higher resistance to acids, alkalies and sulphides, analytically containing substantial percentages of lead oxide, silica and boric acid and also containing sodium oxide about 4%, lithium oxide about 1½%, titanium oxide about 3%, and zirconium oxide about 6%.

Example:

PbO	564 parts
SiO_2	226 "
Borax	100 "
CdO	35 "
Na_2TiSiO_5	100 "
Li_2CO_3	40 "
Zircon sand (66% ZrO_2, 33% SiO_2)	110 "
Boric acid	75 "
	1270 "

Corrosion Prevention of Aluminum

U. S. Pat. 2,312,855. J. S. Thompson, assignor to Parker Rust Proof Co., Mar. 2, 1943. A method which comprises obtaining a corrosion-resistant, paint-holding coating on aluminum or an alloy thereof by subjecting the surface of said metal to the action of a hot, aqueous solution containing as its essential ingredients a dihydrogen phosphate, a double fluoride and an oxidizing agent, and continuing the application of the solution to the surface until there is produced a substantial closely adherent coating the major portion of which is phosphate.

Example:

Zinc dihydrogen phosphate	15.8 g./2L.
Sodium fluosilicate	21 " "
Sodium nitrate	21 " "

Temp. = 180-210°F. Time = 5 min.

The article is rinsed, preferably hot, and dipped in a solution of 7 oz./gal. chromic acid at approximately 180°F.

A list of other suitable oxidizing agents is given in the patent.

Tin Plating

U. S. Pat. 2,313,371. J. R. Stack; A. L. Stack, executrix of said J. R. Stack, deceased, assignor by mesne assignments, to Carnegie-Illinois Steel Corp., Mar. 9, 1943. An electrolyte for the deposition of a substance selected from the group consisting of tin, and tin-lead alloys, which comprises an acid solution of said substance and a sulphone of a substance selected from the group consisting of phenol, cresol, resorcinol and naphthol.

Example:

Benzene disulfonic acid	200-400 g./L.
Sulphone of phenol	5- 25 " "
Tin or lead and tin	20- 80 " "

Temp. = 40-80°C.
Current Density = 10-100 amp./sq. ft.

This bath can be used for either refining or for plating. For the latter higher current densities may be used.

Lead Plating

U. S. Pat. 2,313,372. J. R. Stack; A. L. Stack, executrix of said J. R. Stack, deceased, assignor by mesne assignments, to Carnegie-Illinois Steel Corp., Mar. 9, 1943.

An electrolyte for the deposition of lead comprising lead in solution in benzene disulphonic acid and a sulphone of a substance selected from the group consisting of phenol, cresol, resorcinol and naphthol.

Example:

Benzene disulfonic acid	200-400 g./L.
Sulphone of phenol	5- 25 " "
Lead	20- 80 " "
Temp. = 40-80°C.	

Current Density = 10-100 amp./sq. ft.

This bath can be used for either refining or for plating. For the latter higher current densities may be used.

Electrolytic Metal Coloring

U. S. Pat. 2,313,454. J. E. Stareck, assignor to Kansas City Testing Laboratory, Mar. 9 1943. In a process of electrodepositing cuprous oxide from baths containing in solution copper compounds in which the copper is in the cupric state, and cupric ions, adding to the said bath a substance for effecting an increase of miscelles or nuclei containing cuprous oxide, by which the initial single-electrode voltage at which cuprous oxide is electrodeposited is lowered, and with the bath so conditioned, passing an electric current through said bath from an anode to an article-cathode therein.

Example:

Finely divided cuprous oxide	2 g./L.
Copper lactate	80 " "
50% Sodium lactate	200 cc./L.
Sodium hydroxide	30 g./L.

Electrolytic Metal Coloring

U. S. Pat. 2,313,455. J. E. Stareck, Mar. 9, 1943. A method of decoratively gold coloring articles, comprising electrodepositing a layer of cuprous oxide approximately three-tenths to one millionth of an inch thick on an article having a surface portion of a metal or alloy of the group silver, light colored silver alloys, nickel, light colored nickel alloys, copper alloys and reducing the cuprous oxide to copper, said copper obtained by the reduction of the cuprous oxide being characterized by its evenness of thickness resulting from the evenness with which cuprous oxide is electrodeposited.

Example:

Copper lactate	80 g./L.
Sodium lactate	200 cc./L.
Sodium carbonate	20 g./L.
Sodium hydroxide	30 " "
Stabilizer (aldol)	¼-1.5 " "
Temp. = 70°F.	

Current Density = ¼ amp./sq. ft.

The deposition rate is so adjusted as to give the second order of green in 5 minutes. This is done by adjusting the sodium hydroxide or temperature. A cuprous oxide thickness of 0.0000003"-0.000001" is deposited. The article is then treated as cathode in sodium carbonate solution at room temperature to reduce the cuprous oxide to metal.

The brown shade of the copper is removed by dipping for about 5 seconds in a solution of about 1-3% sulfuric acid.

Electrolytic Metal Coloring

U. S. Pat. 2,313,456. J. E. Stareck, assignor to Kansas City Testing Laboratory, Mar. 9, 1943. A method of producing decorative patterns or designs on articles, comprising forming a layer of cuprous oxide thereon of a thickness such that patterns resulting from myriad fissures occurring in the course of reduction of the oxide to metal are visible to the unaided eye, the minimum thickness being approximately three hundred-thousandths of an inch, and reducing said cuprous oxide producing in the course of reduction myriad fissures which are visible as patterns when viewed by the unaided eye.

Example:

Copper lactate	80 g./L.
Sodium lactate	200 cc./L.
Sodium carbonate	20 g./L.
Sodium hydroxide	30 " "
Stabilizer (aldol)	¼-1.5 " "
Temp. = 110°F.	0.5 volts.

Three minutes are required to deposit about 0.00003" of cuprous oxide. The film is reduced by making it cathode in 4 oz./gal. solution of sodium carbonate, at 70-90°F., depending on the effect desired.

The coating is depolarized by making it anode at 1-2 volts for about 2 minutes in a 4 oz./gal. sodium carbonate solution at 70°F.

Soldering Flux

U. S. Pat. 2,313,736. F. J. Dashner, assignor to American Can Co., March 16, 1943. A liquid rosin flux composition for soldering the seams of can bodies and the like, having improved wetting and solder disseminating characteristics, comprising a resinous material dissolved in a petroleum naphtha solvent as a carrying vehicle.

Example:

Rosin	0.25-5 lb.
Stoddard solvent	1 gallon

Corrosion Prevention of Magnesium

U. S. Pat. 2,313,753. W. S. Loose, assignor to The Dow Chemical Co., Mar. 16, 1943. The method of producing a protective coating upon articles of magnesium and magnesium-base alloys which consists in subjecting the article to the action of a bath comprising a fluoride selected from the class consisting of hydrofluoric acid, fluosilicic acid, hydrofluoboric acid, acid fluorides, and neutral alkali metal fluorides to form a coating on the surface of the article, and then subjecting the coated article to the action of a bath comprising water and an arsenic compound, whereby the fluoride-formed coating is altered to increase the corrosion resistance thereof.

Example:

Immerse for from 1-60 minutes at from room temperature to 80°C. in a 25-30% solution of hydrofluoric acid. Then treat at boiling in a 1% solution of white arsenic for from 5 minutes to 1 hour.

The articles may be made anodic in this bath.

Corrosion Prevention of Magnesium

U. S. Pat. 2,313,754. W. S. Loose, assignor to The Dow Chemical Co., Mar. 16, 1943. In a method of forming a corrosion-resistant coating on the surface of articles of magnesium and its alloys, the step which comprises immersing the article in a water solution of from about 10 to about 35 per cent of fluosilicic acid at a temperature below about 40°C. for a time sufficient to form a coating thereon.

Example:

Fluosilicic acid	28%

Temp.=below 40°C. Time=5-15 minutes.

The articles may be made anodic in this bath.

Plating on Magnesium

U. S. Pat. 2,313,755. W. S. Loose, assignor to The Dow Chemical Co., Mar. 16, 1943. In a method of producing a protective coating upon articles of magnesium and its alloys, the steps which comprise subjecting the article to the action of an aqueous solution containing a soluble salt selected from the group consisting of the alkali metal and ammonium salts of the oxy-acids of the elements chromium, molybdenum, phosphorus, selenium, titanium, tungsten, and vanadium, to form a coating on the article, and thereafter subjecting the coated article to the action of a bath comprising water and an arsenic compound to increase the corrosion resistance of the previously formed coating.

Cleaning Compound

U. S. Pat. 2,314,285. O. M. Morgan, assignor to Allied Chemical & Dye Corp., Mar. 16, 1943. In the process of cleaning metal surfaces involving removal of greasy residues by treatment with an alkaline aqueous cleansing composition, the improvement which comprises immersing the metal to be cleaned in a hot aqueous alkaline cleansing bath containing per gallon of water one-eighth to one ounce of an alkyl aromatic sulfonate having at least 7 carbon atoms in an alkyl radical, as a cleansing assistant and as an emulsifying agent for the residues, while passing an electric current through said bath and through said metal as an electrode.

Porous Chromium Deposits

U. S. Pat. 2,314,604. H. Van der Horst, assignor, by mesne assignments, to Van der Horst Corp. of America, Mar. 23, 1943. The process of producing grooves, pits or depressions in an electrodeposited chromium wearing surface of a wearing member, which consists in passing current through the surface of the electrodeposited chromium for a short time, in an electrolytic bath adapted to remove chromium from such surface and in such a direction that the chromium at such surface is an anode, until at least about 150 ampere-minutes of electricity per square decimeter of the surface, but less than sufficient to completely remove the chromium, has passed through such surface, there being taken thereafter no electrolytic action closing with metal the grooves, pits or depressions produced by the action of said current.

Example:

Reverse current at rate of 150-450 ampere-minutes per sq. dm. in a chromium plating solution or in a 20% caustic soda solution.

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Source of Patents

Question: I am writing for information about U. S. Pat. 1,645,927 dated October 18, 1924 and No. 1,774,269 dated August 26, 1930 covering anodic chromic acid treatment and No. 1,963,363 dated June, 1934 covering racking of work for hard chromium plating. Will you please advise where I can obtain literature on these patents or books or booklets on hard chromium.

I should also like information on insulating materials as mentioned on page 54 of the *Plating and Finishing Guidebook.*—J. J. V.

Answer: Copies of the patents mentioned in your letter may be obtained by addressing a letter together with ten cents in coin for each one desired to the Commissioner of Patents, Washington, D. C.

For stop-off materials, we suggest that you communicate with advertisers in *Metal Finishing* offering such products. Practically all of these are for priority users only.

Polishing Gold After French Baked Enameling

Question: After French baked enameling 10 k. gold die struck emblems, we are having difficulty in bright polishing the gold surface. After pickling in nitric solution and scratch brushing, the surface has a green coating. We have used a strong cyanide strip solution with electric reverse current which removes fire stains, etc., but does not remove the green finish. Can you furnish us with a formula for removing this green coating?

Answer: It is probable that the 10 k. material has a high nickel content. Try using reverse current in a five per cent hydrochloric acid solution after the reverse current treatment in the cyanide solution. Reverse current in hydrochloric acid will dissolve nickel and have only a slight action on the copper and other alloying elements. Boiling in a ten per cent solution of sulfuric acid also may be satisfactory.

Solution for Blackening Brass

Question: Please give me the quantities of cyanide and white arsenic for blackening brass. It is not in any of the platers' guidebooks which I have had for years.—W. B. H.

Answer: A commonly recommended formular for blackening brass containing cyanide and white arsenic is:

White arsenic	2 oz.
Sodium cyanide	5 oz.
Water	1 gal.

The solution is used hot and has been mentioned by Field & Bonney and Perrin.

Plating Nickel Over Old Nickel

Question: Would you be kind enough to send me the proper formula for electroplating nickel over old nickel. At the present time we are experiencing trouble in peeling. —J. V.

Answer: For electroplating nickel on old nickel, the Wood solution has been very successful. The process involves direct current treatment at six volts at room temperature in a solution containing two pounds of nickel chloride and one pint of hydrochloric acid per gallon. Carbon anodes should be used.

This treatment removes the passive oxide film from the nickel and deposits a very thin adherent coating of fresh nickel. The work can then be rinsed and plated as usual.

Silver-Zinc Alloy Plating

Question: We would appreciate any information you might have on silver-zinc alloy plating. We are primarily interested in the alloys ranging from 20-25% zinc and have not as yet been able to plate such an alloy from a cyanide bath.—S. E. P., Inc.

Answer: We do not have any references on this alloy but cadmium-silver has been plated in all proportions from cyanide solutions and it may be possible to plate zinc-silver alloys from the same type of bath. We suggest that you consult the paper presented by Faust, Henry and France which may be found in the Transactions of the Electrochemical Society, Vol. 72, page 479 (1937).

Plate on Latched Surfaces Galls

Question: I have a shop problem which is, perhaps, more of a design problem. On an intricate aircraft mechanism, we have a pair of latching surfaces 0.120″ wide. We chromium plate both surfaces endeavoring to get 0.0005″ of hard chromium direct on the steel. A pressure of 30 pounds is exerted on the surfaces one of which is straight, the other of which has a slight radius.

On a sample test on a certain number of units, the mechanism must trip five thousand times without failure. Some of these parts go five thousand cycles without galling while some gall after a few hundred cycles. Those that gall appear to have 0.0002″ of chromium. What do you suggest as a possible cause and will you also advise whether it is practical to obtain 0.0005″ of chromium plate without putting on a heavier plate and then grinding.—D. C. C.

Answer: It is possible that you do not have sufficiently heavy chromium to prevent the base metal from flowing under pressure. If the steel is case-hardened and the depth of the case is not sufficient, most of the case may be removed by pickling and leave a soft surface underneath the chromium plate. If the steel is cyanide hardened and a depth of case of no less than 0.002″ is had, the surface of the steel will be clean and will need practically no pickling before chromium plating. We would suggest that you examine the condition of the surface underneath the chromium plate very carefully.

In answer to your second question, we would advise that for a thickness of 0.0005″ of chromium, it is generally unnecessary to plate heavier and grind to size except where exceptionally close tolerances are required.

Blackening Bottle Caps

Question: Have you done any research on finishing black iron and tin plate crowns for the beverage industry. I should like to have whatever information you have available on such processes. A black, tan or brown coat is acceptable and a tan or brown bond is preferable.—A. S. of T.

Answer: Before a finish can be produced, it is necessary to remove the lithographing, the cork and the tin coating from the caps. This is done by treatment with hot caustic soda. The fresh finish can then be applied by any one of the processes using caustic soda and an oxidizing agent, suppliers of which will be found in current issues of *Metal Finshing.*

Since practically all of the oxidizing agents are restricted and no priority is available for blackening bottle caps, we do not believe it will be possible for you to obtain the materials for blackening with this process, except in rather small amounts. However, in the Organic Finishing Section, processes using lacquers and enamels are discussed.

Dictionary of Metal Finishing Chemicals

Chromic Anhydride: See Chromic Acid.

Chromic Chloride: $CrCl_3 \cdot XH_2O$. Sp. gr. 2.76. Purplish blue crystalline powder. Also known as Chromium Chloride, Chromium Sesquichloride. Soluble in water and alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5, 10 lb.); Boxes (25, 50 lb.); Kegs (50, 100 lb.); Drums (100 lb.); Barrels (300, 450 lb.).

Chromic Fluoride: $CrF_3 \cdot XH_2O$. Sp. gr. 3.78. Fine crystalline powder. Also known as Chromium Fluoride. Soluble in water and acids. Insoluble in alcohol. Grades: Technical, C. P. Containers: Waxed Bottles (1, 5 lb.); Kegs (25, 50, 100 lb.); Barrels (400 lb.).

Chromic Hydrate: See Chromium Hydroxide.

Chromic Hydroxide: $Cr(OH)_3 \cdot XH_2O$. Green, gelatinous precipitate or powder. Also known as Chromium Hydroxide, Chromium Hydrate, Chromic Hydrate, Insoluble in water. Soluble in acids, alkalis. Grades: Technical, C. P. Containers: Bottles (1, 5 lbs.); Kegs (100 lb.); Barrels (300 lb.).

Chromic Nitrate: $Cr(NO_3)_3 \cdot XH_2O$. Monoclinic, purple crystals and granules. Also known as Chromium Nitrate. Soluble in water. Grades: Technical, C. P., 30% solution. Containers: Bottles (1, 5 lb.), Kegs.

Chromic Oxide: Cr_2O_3. Mol. wt. 152.02. Sp. gr. 5.2. M. P. 1990°C. Green, crystalline powder. Also known as Chromium Oxide, Chrome Green. Insoluble in water, acids and alkalis. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.), Cartons, Cans (1, 10 lb.); Kegs (100 lb.); Barrels (300, 400, 500 lb.).

Chromic Sulfate: $Cr_2(SO_4)_3 \cdot 15H_2O$. Mol. wt. 662.44. Sp. gr. 1.867. Dark green, amorphous scales and pearls. Soluble in water. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Tins (1, 5, 10, 25, 50 lb.); Drums (100 lb.); Barrels (500 lb.).

Chromic Trioxide: See Chromic Acid.

Chromium: Cr. At. wt. 52.01. Sp. gr. 7.14 M. P. 1615°C. Very hard, cubic, steel gray, shiny metal. Soluble in hydrochloric acid and sulfuric acid. Insoluble in nitric acid. Grades: Technical, fused lumps, crystals, powder. Containers: Bottles, (1, 10 g. 1 oz.; ¼, 1 lb.); Cans (1, 5 lb.); Kegs; Barrels.

Here is the sixth installment of the series which, in its entirety, will comprise a complete dictionary of terms for the metal fiinshing industry. This is a regular monthly feature and is laid out as a single sheet for convenient clipping purposes.

Chromium Acetate: See Chromic Acetate.

Chromium Chloride: See Chromic Chloride.

Chromium Fluoride: See Chromic Fluoride.

Chromium Hydrate: See Chromic Hydroxide.

Chromium Hydroxide: See Chromic Hydroxide.

Chromium Nitrate: See Chromic Nitrate.

Chromium Oxide: See Chromic Oxide.

Chromium Potassium Sulfate: $Cr_2(SO_4)_3 K_2SO_4 \cdot 24H_2O$. Mol. wt. 998.84. Sp. gr. 1.83. M. P. 89°C. Dark violet or green crystals, powder, granules. Also known as Chromium Potassium Alum, Chrome Alum. Solubility, 24 at 25°C; 50 at 100°C. Soluble in dilute acids. Grades: Technical, C. P. Containers: Bottles, Cartons, Tins (1, 5 lb.); Cans, Boxes (5, 25 lb.); Kegs (100, 125 lb.); Drums (100, 250 lb.); Barrels, 350, 430-520 lb.); Casks (500 lb.); Cakes (775 lb.).

Chromium Sesquichloride: See Chromic Chloride.

Chromium Sulfate: See Chromic Sulfate.

Chromium Trioxide: See Chromic Acid.

Cinnabar: See Mercuric Sulfide.

Citric Acid: $C_3H_4OH(COOH)_3 \cdot H_2O$. Mol. wt. 210.14. Sp. gr. 1.542. Colorless crystals, granules, white powder. Also known as Oxytricarballylic Acid. Loses water of crystallization when heated. Solubility in cold water about 133. Very soluble in alcohol. Slightly soluble in ether. Grades: Technical, U. S. P., C. P. Containers: Bottles, Cartons (1, 5 lb.); Drums (25 lb.); Kegs, Boxes (25, 50, 100, 112 lb.); Drums (25, 50, 100, 200, 250 lb.); Barrels (200, 230 lb.).

Clay: Natural product consisting mainly of aluminum silicate hydrated plus various impurities.

Clove Oil: Sp. gr. 1.05-1.07. B. P. 250-260°C. Pale yellow, thin liquid. Soluble in alcohol, ether, chloroform. Insoluble in water. Grades: Technical. Containers: Bottles (1, 5, 6 lb.); Tins (25, 60 lb.).

Coal, Glance: See Carbon, Gas.

Coal Naphtha: See Benzene.

Coal Oil: Crude oil from the destructive distillation of soft coal, crude kerosene or petroleum.

Cobalt: Co. At. wt. 58.94. Sp. gr. 8.71. M. P. 1480°C. Silvery gray, shiny metal with a slight blue cast. Shot, Bars, Powder, Strip. Hard. Ductile. Insoluble in water. Soluble in acids. Grades: Technical, C. P. Containers: Cartons (1 lb.); Bottles (1, 5 lb.); Bags; Casks.

Cobalt Acetate: $Co(CH_3COO)_2 \cdot 4H_2O$. Mol. wt. 249.09. Sp. gr. 1.705. Monoclinic, reddish-violet, deliquescent crystals. Also known as Cobaltous Acetate. Soluble in water, acids and alcohol. Grades: Technical, C. P., crystals or powder. Containers: Bottles (1, 5 lb.); Kegs (25, 100 lb.); Barrels (400 lb.).

Cobalt Ammonium Sulfate: $CoSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$. Mol. wt. 395.24. Sp. gr. 1.902. Ruby red crystals. Also known as Cobaltous Ammonium Sulfate. Solubility, 20 at 20°C. and 45 at 80°C. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (25 lb.); Cans; Boxes.

Cobalt Carbonate: $CoCO_3$. Mol. wt. 118.95. Red crystals or rose-colored powder. Also known as Cobaltous Carbonate. Insoluble in water. Soluble in acids. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs (25, 100 lb.); Barrels (350 lb.).

Cobalt Chloride: $CoCl_2 \cdot 6H_2O$. Mol. wt. 237.95. Sp. gr. 1.92. M. P. 86°C. Monoclinic, red crystals. Color is blue when dehydrated. Also known as Cobaltous Chloride. Solubility, 77 at 0°C. and 191 at 100°C. Very soluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5, 25 lb.); Tins; Kegs (100 lb.); Barrels (400 lb.).

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Cobalt Nitrate: $Co(NO_3)_2 \cdot 6H_2O$. Mol. wt. 291.05. Sp. gr. 1.87. Monoclinic, red, deliquescent crystals. Also known as Cobaltous Nitrate. Solubility, 134 at 0°C. Very soluble in hot water. Soluble in alcohol, acids. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5, 10 lb.); Kegs (25, 100 lb.); Barrels (400 lb.).

Cobalt Oxide: Co_2O_3. Mol. wt. 165.88. Sp. gr. 5.2. Steel gray to black powder. Also known as Cobaltic Oxide, Cobalt Peroxide. Insoluble in water. Soluble in acids. Grades: Technical, Purified, C. P. Containers: Bottles (1 lb.); Cans (1, 5, 10 lb.); Barrels (350 lb.).

Cobalt Peroxide: See Cobalt Oxide.

Cobalt Sulfate: $CoSO_4 \cdot 7H_2O$. Mol. wt. 281.11. Sp. gr. 1.95. M. P. 96.8°C. Monoclinic, reddish pink crystals. Also known as Cobaltous Sulfate. Solubility, 60 at 3°C. and 67 at 70°C. Slightly soluble in alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (25, 100 lb.); Barrels (400 lb.).

Cobaltic Oxide: See Cobalt Oxide.

Cobaltous Acetate: See Cobalt Acetate.

Cobaltous Ammonium Sulfate: See Cobalt Ammonium Sulfate.

Cobaltous Carbonate: See Cobalt Carbonate.

Cobaltous Chloride: See Cobalt Chloride.

Cobaltous Nitrate: See Cobalt Nitrate.

Cobaltous Sulfate: See Cobalt Sulfate.

Colophony: Sp. gr. 1.08. M. P. 100-150°C. A resin in lump or powder form obtained as residue from turpentine distillation. Also known as Rosin, Pine Resin. Grades: B, C, D, E, F, G, H, I, K, L, M, N, W-G, W-W ranging from dark to light. Also Virgin, Yellow Dip and Hard. Containers: Boxes (1, 5, 25, 100 lb.); Kegs (125 lb.); Drums (230, 280 lb.); Barrels.

Columbium: Cb. At. wt. 92.91. Sp. gr. 8.4. M. P. 1950°C. Steel gray, lustrous metal. Also known as Niobium. Insoluble in water. Soluble in hot sulfuric acid. Slightly soluble in hydrochloric acid, nitric acid and aqua regia. Grades: Technical. Containers: Bottles (¼, 1 g.).

Common Rosin: See Colophony.

Copper: Cu. At. wt. 63.57. Sp. gr. 8.93. M. P. 1083°C. Reddish, lustrous metal. Malleable. Ductile. Insoluble in water. Soluble in nitric acid, hot sulfuric acid. Very slightly soluble in hydrochloric acid and ammonia. Grades: Electrolytic, Precipitated, C. P.; shapes, turnings, shot, foil, sheet, powder, granules, wire. Containers: Tins (1, 5, 25 lb.).

Copper Acetate: $Cu(C_2H_3O_2)_2 \cdot H_2O$. Mol. wt. 199.67. Sp. gr. 1.88. M. P. 115°C. Dark green or greenish blue powder or fine crystals. Also known as Cupric Acetate, Neutral. Solubility, 7% in cold water and 20% in hot water. Soluble in alcohol. Grades: Technical, Refined, C. P. Containers: Bottles (1, 5 lb.); Kegs (100, 110 lb.); Barrels.

Copper Acetate, Basic: Approx. formula $= 2Cu(C_2H_3O_2)_2 + CuO$. Green to blue crystals or powder. Also known as Verdigris (which is a variable mixture of Basic Copper Acetates and Copper Subacetate), Blue Verdigris, Green Verdigris, Copper Subacetate and Copper Acetate, Technical. Soluble in water and acids. Grades: Technical. Containers: Bottles (1, 5 lb.). Cans (1, 10, 25 lb.); Kegs (100, 110 lb.); Drums (100 lb.); Barrels (250, 375 lb.).

Copper Acetate, Neutral: See Copper Acetate.

Copper Ammonium Chloride: $CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$. Mol. wt. 277.51. Sp. gr. 2.0. Tetragonal, blue crystals. Decomposes when heated. Solubility, 34 at 0°C. and 99 at 80°C. Soluble in acids, alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (100 lb.).

Copper Ammonium Sulfate: $Cu(NH_3)_4 \cdot SO_4 \cdot H_2O$. Mol. wt. 245.77. Fine, blue, rhombic, crystalline powder. Also known as Copper Ammonio Sulfate, Cupric Ammonium Sulfate, Copper Amino Sulfate. Decomposes when heated and in hot water. Solubility in cold water, 18 at 20°C. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (100 lb.).

Copper Amino Sulfate: See Copper Ammonium Sulfate.

Copper Ammonio Sulfate: See Copper Ammonium Sulfate.

Copper Carbonate: $2CuCO_3 \cdot Cu(OH)_2$. Mol. wt. 344.74. Sp. gr. 3.9. Monoclinic, blue crystals or powder. Also known as Artificial Azurite, Basic Copper Carbonate, Mountain Blue, Cupric Carbonate, Blue Copper Carbonate. Decomposes when heated and in hot water. Insoluble in water. Soluble in acids, ammonia, cyanide solutions. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (100 lb.); Barrels.

Copper Carbonate, Basic: $CuCO_3 \cdot Cu(OH)_2$. Mol. wt. 221.17. Sp. gr. 4.0. Dark green, fine crystals or powder. Also known as Artificial Malachite, Cupric Carbonate, Basic. This is common copper carbonate. Insoluble in water. Soluble in acids, ammonia, cyanide solutions. Decomposes when heated and in hot water. Grades: Technical, C.P. Containers: Bottles (1, 5 lb.); Cartons (1, 5, 25, 50 lb.). Boxes (25, 50 lb.); Drums (100 lb.); Kegs (100, 125 lb.); Barrels (125, 175, 200, 250, 300, 400 lb.).

Copper Carbonate, Blue: See Copper Carbonate.

Copper Chloride: $CuCl_2 \cdot 2H_2O$. Mol. wt. 170.52. Sp. gr. 2.4. Rhombic, green, deliquescent crystals. Also known as Cupric Chloride. Solubility, 110 at 0°C. and 192 at 100°C. Soluble in alcohol and ammonium chloride solutions. Grades: Technical, Purified, C. P. and C. P. anhydrous powder. Containers: Bottles (1, 5 lb.); Cans (1, 5, 25 lb.); Boxes (25 lb.); Kegs (100, 125 lb.); Drums (100 lb.); Barrels (300, 500, 550 lb.).

Copper Cyanide: CuCN. Mol. wt. 89.59. Sp. gr. 2.9. M. P. 474.5°C. White or greenish white powder. Also known as Cuprous Cyanide. Insoluble in water. Soluble in hydrochloric acid, nitric acid, ammonia, cyanide solutions. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb); Tins (1, 5, 10, 25 lb.); Drums (50, 100, 200 lb.); Kegs (100 lb.).

Copper Hemioxide: See Cuprous Oxide.

Copper Hydrate: See Copper Hydroxide.

Copper Hydroxide: $Cu(OH)_2$. Mol. wt. 97.59. Sp. gr. 3.368. Amorphous, blue powder. Also known as Copper Hydrate, Cupric Hydroxide. Decomposes when heated and in hot water. Insoluble in cold water. Soluble in acids, ammonia, cyanide solutions, alcohol. Grades: Technical. Containers: Bottles (1, 5 lb.); Tins; Drums (100 lb.); Barrels (300 lb.).

(To be continued next month)

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

"Tank Watchman"

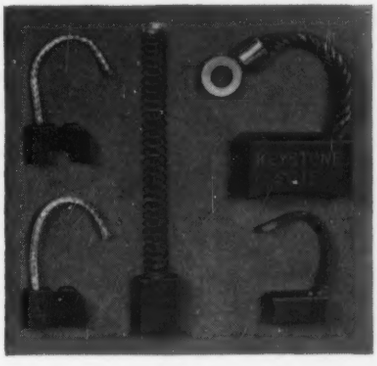
A new automatic tank controller has been developed by Plating Processes Corporation, Dept. MF, Holyoke, Mass. It is claimed that the instrument will automatically maintain a predetermined solution level together with the correct temperature, whether the solution has a tendency to heat or to cool. It sets a warning if the tank springs a leak. It also sets a warning at the tank and in the watchman's station if the solution level becomes too high from any cause at all, or if the temperature creeps too high or too low.

This new instrument can be set to start the tank operations in the morning and shut them off automatically at night.

Lead Fluoborate Solution

Baker and Adamson, Division of General Chemical Co., Dept. MF, 40 Rector St., New York, N. Y., are offering a solution of lead fluoborate for sale to manufacturers and commercial plating establishments.

The solution is concentrated and is ready-to-use upon dilution with water. It is sediment free and requires no filtering. It is claimed that the solution plates directly on steel and cast iron.



New Brushes

New grades of brushes for ring and commutator applications have been developed for the aviation and electrical industries by Keystone Carbon Co., St. Marys, Pa. The illustration shown above shows a few designs which are made in various grades of copper-graphite and silver-copper-graphite—created as a part of this company's expanding line of individually designed small brushes. Certain types were developed specifically for current control apparatus where extreme precision is vital. The shunts are moulded into the brush and establish a perfect connection. Low contact drop, high current carrying capacity and a low coefficient of friction are stated to be inherent characteristics of these brushes.

New Multiplater

W. Green Electric Co., Inc., Dept. MF, 130 Cedar St., New York, N. Y., have announced a new multiplater—Model 86—which provides eight separate selenium rectifier sections (each having an output of 6 volts, 500 amperes) in one cabinet mounted on cone-bearing casters.

Separate output terminals make it possible for each rectifier section to be connected at a separate tank or for the individual sections to be added together for higher voltage or greater current capacity; or for them to be grouped together in a single bank.

Several hundred combinations are possible when the sections are used individually or in groups; for instance: if all eight sections are inter-connected, any of the following outputs may be obtained:

6 volts	4,000	amperes
12 "	2,000	"
24 "	1,000	"
48 "	500	"

Literature describing this new development is available upon request from the company.

New Sweeping Compound

Fibre-Tex is the name of a new floor cleaning compound which is said by its manufacturer to eliminate the danger of fire usually inherent in materials sold for this purpose.

The product is said not to burn even when the flame of a blow-torch is played directly upon it, as in the illustration, nor as the result of spontaneous combustion.

It is also claimed for the material that it

is highly absorbent of oils and grease and has an active cleaning effect upon floors on which it is consistently applied. Grease and oil-caked dirt are said to be removed; safety stripes and other floor markings made plainer and, in general, plant housekeeping greatly improved.

Fibre-Tex is manufactured by Lacey-Webber Co., Kalamazoo, Mich. It is packaged in 50 lb. cartons, and is distributed through automotive, hardware, marine, paper and mill and janitor supply wholesalers.

Water Purifier

Illinois Water Treatment Co., Dept. MF, 856 Cedar St., Rockford, Ill., are the manufacturers of equipment units designed to render water as pure as though distilled, thus eliminating the troubles caused by mineral salts in the supply. The method is based on ion exchange and uses Amberlite resins.

Ion exchange resins can also be used to reclaim precious metals ordinarily washed away in solution.

The units operate without heat or fuel and are available in capacities of from 100 to 50,000 gallons an hour.

Free literature on this new equipment may be secured upon request from the company.

Professional Directory

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War plating plants designed and streamlined for increased production.
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New York City

Carrier With Built-in Brake

A new 14 in. lift model E carrier with built-in brake for placing and removing 55-gallon drums on and off skids, scales and platforms, has been announced by Ernst Carrier Sales Co., 1456 Jefferson Ave., Buffalo, N. Y.

The built-in brake is said to provide smooth, slower and easier lowering of the container from the top 14 in. position. To raise the container a full 14 inches off the floor, the handle is lowered from the up-position to the horizontal position where it automatically locks. By unlocking the handle and applying the brake, the container is lowered to the floor.

Accidents are claimed to be obviated by the new patented lifting device which lifts containers vertically into locked position on the carrier. The carrier operator does not even have to touch the container. In addition, the manufacturers state, these carriers save floors, lengthen life of drums and protect drum contents.

Complete information on the patented 14 in. lift, 700-pound capacity carrier is available by writing to the company.

Invisible Photoelectric Protection System

A new photoelectric protection system now available from Photoswitch Inc., 77 Broadway, Cambridge, Mass., projects a fence of invisible light over distances as great as 1500 feet, according to the manufacturer, and gives instant local or central-station alarm if an intruder enters the protected area. Designed to meet government requirements, the equipment has a long operating range and is said to be especially suited to the protection of harbors, yards, docks, industrial properties, airports, and similar large areas.

In operation, Light Source Type L60M is aligned with Receiver Type A30M to which it focuses a modulated beam of infra-red light. Because Type A30M responds only to the frequency of light emitted from the light source, it is not affected by other artificial light or by daylight. This permits extreme sensitivity, enabling the equipment to function over a greater range than it has been previously possible to cover with photo-electric controls, and at the same time guarantees compete stability of operation. If invisible infra-red light is not required, the operating range of the system exceeds 2000 feet.

Within Light Source Type L60M, a fan driven by a gearless, brushless motor, serves as a light chopper to produce rapidly fluctuating light of the desired frequency, and also cools the heavy-duty lamp, assuring long life. Once the invisible beam of light projected to Receiver Type A30M is momentarily broken, the alarm circuit latches in operation. An additional safety feature is that either power or tube failure will cause the alarm circuit to operate as though the light beam had been broken.

Receiver Type A30M and Light Source Type L60M are of rugged construction, built for unlimited service-free operation, and are furnished in weather-proof housings. Supplied with these units is an auxiliary latching relay with reset button. The equipment is designed for operation on 105 to 125 volts A.C.

Koroseal as Insulator

Koroseal, the plasticized polyvinyl chloride developed and sold exclusively by The B. F. Goodrich Company, Dept. MF, Akron, O., has found another important wartime use.

A large New York company which utilizes a special process for chrome hardening surfaces of engine cylinders, gun barrels and other products is using Koroseal sheet as the insulator for use in plating these.

A pilot plant where other concerns are being instructed on the process is now in operation, and the sheets are used there.

Truck Towing Conveyor

Designed to tow trucks loaded with any type of commodity, through sub-assembly and final assembly, a new truck towing conveyor installation developed by the Alvey Ferguson Co., 693 Disney St., Cincinnati, O., is said to eliminate the hard work of pushing and the danger of sparks from electric or gasoline-operated towing equipment. It is claimed that towing hooks are easily detached by hand or automatically at any pre-determined location where parts carried are processed or assembled.

New Dump Hopper

A new model No. 4004 automatic end Dump Hopper on casters is announced by H. L. Pitcher Co., Dept. MF, 12400 Strathmoore, Detroit, Mich., exclusive sales agent for the products made by the Rose Manufacturing Co., Detroit.

When the latch is released and the load is dumped, the bucket is so balanced that it automatically returns and latches in position when reloaded. It rides empty in the balanced position.

Mounted on heavy duty all steel casters, it is a particularly adaptable unit for the handling of sand, gravel, coal, stampings, small castings and all kinds of scrap and refuse. It is built of structural steel and heavy plate and is designed to fit any kind of lift truck but may be built to specifications as to capacity and yardage content. This is the fourth type of dump hopper this company has designed and built.

Steel Reinforced Work Gloves

Industrial Gloves Co., Dept. MF, Danville, Ill., have developed an improved type steel reinforced gauntlet for heavy duty handling.

Though heavily reinforced, the glove is flexible because grain leather is used. Steel ribbons are placed diagonally to assure protection against cutting edges of material handled. The entire palm, extending up to the first joint of all the fingers and well around to the back of the fore finger is reinforced with an extra piece of leather. The thumb is patched and strapped for extra strength and service. All closing seams are stitched with steel thread.

The glove may be had as pairs, all rights, all lefts or any combination of rights and lefts as required.

". . . . . experiments indicate that the new (Beckman) high-alkaline type glass electrode is the first practical and accurate method for pH control of cyanide plating baths."

Gray—Proc. Am. Electroplaters' Soc.

BETTER DEPOSITS AT HIGHER PLATING SPEEDS with *Beckman* pH CONTROL!

Type "E" Glass Electrode Equipment Ideal for Cadmium, Copper, Zinc, Brass and Similar Plating Operations

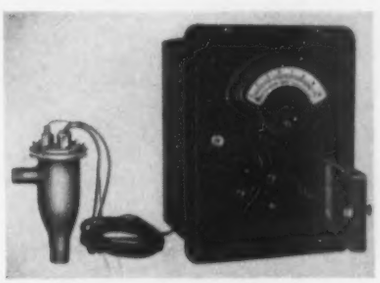
With today's urgent need for higher speeds, greater efficiencies, reduced losses in ALL plating operations, Beckman pH Control is a "must" for modern plating plants. For Beckman is the *only* pH equipment that is equally efficient in all plating baths, acid or alkaline, *regardless of color, turbidity, organic substances, or oxidizing and reducing agents!*

And Beckman is the only modern pH equipment providing glass electrodes that can be used in highly alkaline solutions, *even in the presence of sodium ions.* This Beckman development is an invaluable aid to such plating operations as cadmium, copper, zinc, brass (both rubber-adhesion and straight brass plating) and similar plating operations. By using it you can obtain better deposits—at higher plating speeds—with fewer rejects!

Write our engineering department for further information and descriptive literature!

BECKMAN INSTRUMENTS DIVISION
NATIONAL TECHNICAL LABORATORIES
South Pasadena • California

The Beckman Industrial pH Meter—ideal for portable plant and field use. It combines laboratory accuracy with a ruggedness and a simplicity of operation that permit quick, accurate pH measurements on all types of plating baths by even inexperienced help. *Write for Bulletin 21!*



The Beckman Automatic pH Indicator —the most advanced instrument available today. Continuously indicates pH fluctuations and can also be equipped to provide a written record and completely automatic pH control. Ideal for maximum efficency in large-scale plating operations. *Write for Bulletin 16!*

Beckman THE LEADING NAME IN pH

Drum Wrench

Michael A. Schinker, Dept. MF., 736 East 63rd St., Chicago, Ill., is the manufacturer of the "All Plug" drum wrench. A self-contained unit with no adapters or other easily mislaid parts, this wrench is said to service more than 150 types and sizes of domestic and foreign drum plugs.

Construction of the wrench is as follows. A six pronged alloy steel spider, 5½ inches in diameter, is built around a hub through which a ¾ inch by 18 inch steel hexagonal slide-bar is fitted. Two drain plug nipples are located at the ends of the bar. An automatic stop holds the spider at the center of the bar for fast work. A slight tap releases the spider so that it may be used at the end of the bar for heavy duty. All parts are heat treated, machined and ground. The wrench is also available in a model made of non-ferrous materials for use where explosive vapors may be present.

Portable, Electrically Heated Metal Degreasing, and Cleaning Tank

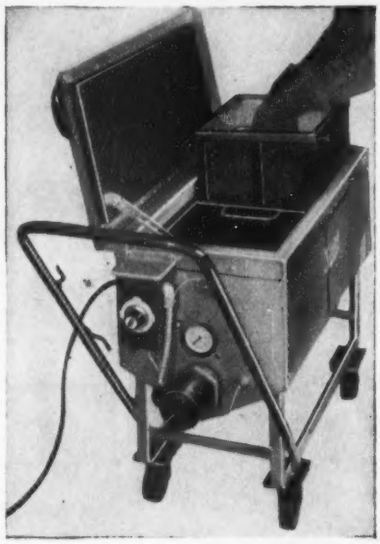
Fast, economical cleaning and degreasing of metal parts and products is the purpose of the Dipmaster, Jr., a portable, insulated, electrically heated dipping tank, manufactured by Aeroil Burner Company, Inc., Dept. MF, Park Ave., West New York, N. J.

Holding 12 gallons of solution, which is its normal capacity or 15 gallons maximum, the tank is equipped with a heating element located inside on the bottom where it is completely submerged. Thus, there is no gap to jump between the heating element and the liquid itself. Average heating time from a cold start to boiling point (212° F.) is 1¼ hours.

Four casters (2 swivel type, 2 rigid), provide the equipment with maneuverability. It is ready for instant operation by plugging it in on 110 or 220 volt A.C. or D.C., using the extension cord with which it is provided.

Standard equipment furnished with the Dipmaster, Jr. includes two dipping baskets, in which the parts are placed, each measuring 11¾" long x 11¾" wide x 8" deep; a bi-metal type thermometer registering a temperature range of 100-600° F. and a thermostatic control of the rigid, shock-proof type, equipped with a dial and knob to shut off the heating element manually and to maintain automatically any desired temperature between 100-550° F.; also a draw-off cock for emptying the tank.

In order to reduce heat loss to a minimum the steel tank is insulated all around the inner shell. An insulated cover with handle has a bracket to keep it in open position when the tank is being loaded or unloaded.



The electric heating element can be removed whenever any cold solutions are used or the bottom of the tank is to be cleaned, and the head of this element as well as those of the thermostat and thermometer are mounted to the rear head of the tank so that they are protected against damage. They can be seen and adjusted while in operation.

Larger, stationary models of the equipment are available, ranging up to 600 gallon capacity, and they are heated by kerosene, city or liquified gases, with removable immersion tube heating units in the tank so that the heat is delivered in the liquids as it is with the electrically heated model.

Plastic Respirator

The aluminum Dustfoe Respirator, manufactured by Mine Safety Appliance Co., Braddock Thomas and Meade Sts., Pittsburgh, Pa., is now available in an all-plastic model, approved by the U. S. Bureau of Mines. Known as the Clear-Vue Model Dustfoe, it is a compact, lightweight respirator made of transparent plastic. It is efficient, durable, odorless, non-corrosive, and is a non-conductor of electricity and heat, states the company.

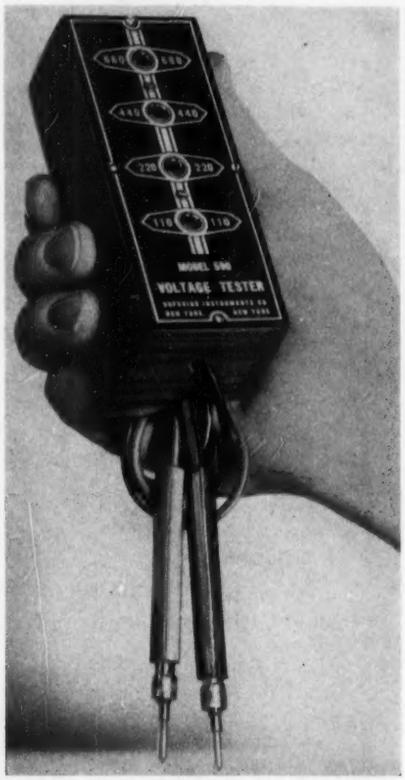
The respirator's transparent construction makes possible the inspection of the filter for proper insertion and seal without removal. A plastic catch on the filter case locks in place only when the filters are in the correct position. The unit is comfortable to wear and is claimed to give protection against all pneumoconiosis-producing, nuisance, or toxic dusts. The self-adjusting facepiece has a new form-molded sponge rubber face cushion. An army-type exhalation valve provides immediate drainage of any condensation from the facepiece.

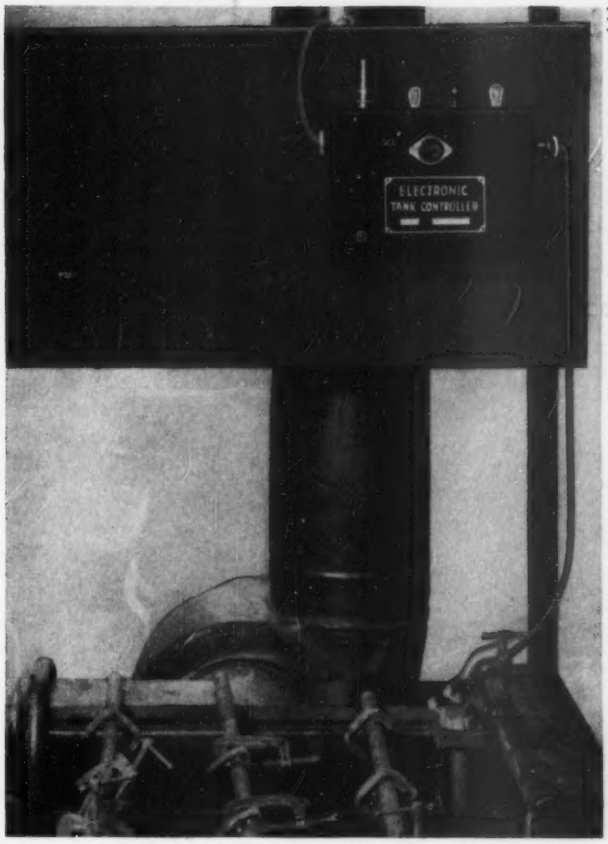
Unobstructed downward and sidewise vision is permitted and goggles or head coverings can be worn without interference.

Voltage Tester

Superior Instruments Co., Dept. T., 227 Fulton St., New York, N. Y., are the manufacturers of Model 590—a voltage tester which reads like a thermometer.

After connecting the needle-pointed test prods across any electric line, the instrument automatically indicates whether the voltage is 110, 220, 440 or 660 volts; if the current is A.C. or D.C.; if the applicance, motor, etc., connected in the line is "open"; which leg is grounded; if the frequency is 25 or 60 cycles; if the fuse is "blown"; when one side of an appliance or motor connected to the line under test is "grounded"; excessive leakage between a motor and a line, and when a three phase motor is running erratically due to a "blown" fuse.





Patent Pending

Here's What This NEW Controller Will Do!

1. *Keep tanks at constant level*
2. *Maintain solution at correct temperature*
3. *Warn operator of tank leakage*
4. *Ring warning bell if tank overflows, at the tank or in remote position*
5. *Identify operations in progress with colored lights*
6. *Automatically start and stop tank operation at any predetermined time*
7. *Provide constant means of checking specific gravity*
8. *Can be connected with existing thermostat*

Electronic TANK CONTROLLER

"The New Automatic Tank Watchman"

Easily attached to your present tanks or equipment, this new ELECTRONIC CONTROLLER will conserve many man hours of watching . . . it will keep your tanks at proper level at all times and insure correct temperature of solution.

Practically fool-proof. The ELECTRONIC TANK CONTROLLER works "without pay."

Can be immediately installed by your electrician on all types of tanks without boring holes of any kind.

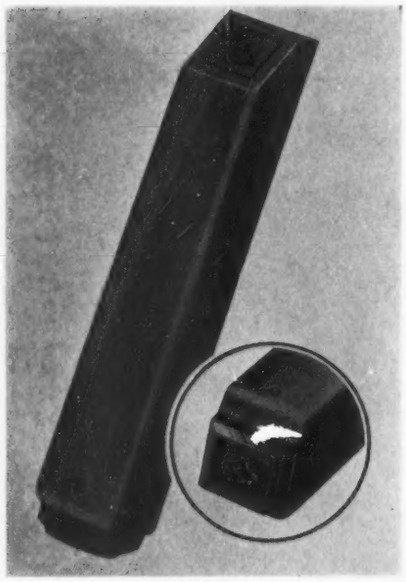
Take advantage of this practical "man hour" and "material saver," put it to work for you without delay. It's guaranteed to perform the duties which we claim without fuss or bother.

Made in 3 Models: MIDGET—STANDARD—MASTER

Write today for further details and prices

PLATING PROCESSES CORPORATION

Holyoke • Massachusetts



Etching Stamp

James H. Matthews & Co., Dept. MF, 3942 Forbes St., Pittsburgh, Pa., is the manufacturer of the etching stamp pictured above.

The material used in the stamp is designated as the company's "S-22" synthetic.

The shape and construction of this item make it easy to handle and convenient to store.

Acid Siphon

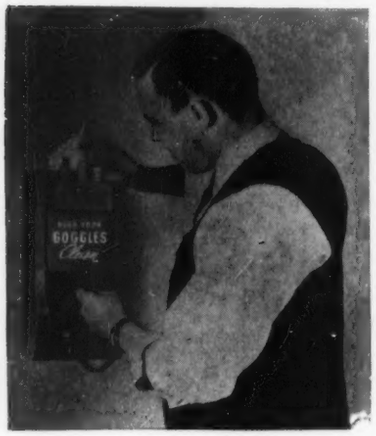
Utilizing the safe vacuum pump principle, the siphon illustrated discharges acids and chemicals from carboys, drums and barrels. It is made of acid-resistant casing inserted into a carboy, has flexible plastic siphon tubing and positive flow control valve at the pouring end. Simple pumping action of tubing inside the casing generates steady flow. The equipment has no glass parts to break, requires no bulbs or auxiliary pumping apparatus, can not be overprimed or overfilled, and does not build up dangerous pressures, according to the manufacturer. It is further claimed the materials are fully tested for sulfuric, nitric, hydrochloric, sulfurous, glacial acetic, acetic acids, bleaching solutions and many other chemicals. For further information, address Pulmosan Safety Equipment Corp., Dept. MF, 176 Johnson St., Brooklyn, N. Y.

New Deburring Machine

Belke Manufacturing Co., Dept. MF, 947 N. Cicero Ave., Chicago, Ill., announces the development of a new equipment called the Belke Scientific Deburring Machine.

The machine is claimed to produce one hundred per cent uniformity in removing only the burrs from parts subjected to its action. It is used with a specially formulated compound.

Sturdily built and easy to load and empty, the machine has an easy clamp water-tight cover and a large capacity cylinder. It is operated electrically and is equipped with gear reduction drive.



Goggle Cleaning Station

The goggle cleaning station, announced by Mine Safey Appliances Co., Dept. MF, Braddock, Thomas and Meade Sts., Pittsburgh, Pa., is intended to encourage workers to wear their goggles and to keep them clean.

Designed for convenient wall mounting through the plant, the unit consists of a compact case equipped with Fogpruf—lens cleaning and anti-fogging agent—and Optical Wiping Tissues.

Operation is simple. A tap on the inverted vial sprays Fogpruf on the goggle or spectacle lens. Cleaning tissues are pulled from the opening in the top of the station, and may be discarded in a receptacle in the lower part of the case.

The front panel of the station slides up, making accessible a compartment for an additional supply of tissue and lens cleaner. Six vials of Fogpruf and two packages of M.S.A. Optical Wiping Tissues are furnished with each unit.

Dust Collector

Another new dust collector for processing of magnesium is announced by Industrial Equipment Corporation, Detroit, Mich.

It marks another step forward in equipment used for the processing of this hazardous material, and is of particular note because its development resulted from a desire to meet the country's effort to conserve critical materials.

The new design also has effected economies which reflect favorably in installation costs. This new model is claimed to be very efficient—yet it has only one mechanical moving part: a fan unit.

Dust laden air is drawn through an orifice causing a violent spray of water. Here the dust is "water-whirled" out of the air and is knocked down into a tank below, where it forms a sludge which can be easily removed, it is said.

Since the operation of the Hydro-Whirl permits the cleaned air to be returned to the room, less heat loss is suffered, making for material savings in heating costs.

Units are available for use in either booth type or individual collectors for grinding stands.

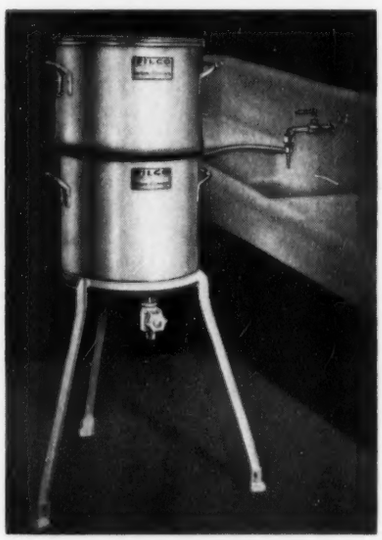
New Filter

The Filter Paper Co., 57 E. 24 St., Chicago, Ill., have announced the development of the Filco Vacu-Filter which is designed to filter quantities of acids quickly and easily by means of a simple vacuum.

The unit employs two cylindrical containers one fitted into the other and sealed with a rubber gasket. The top container is fitted with a sheet of filter paper which is placed over the perforated bottom of the container. A vacuum is created in the lower container by means of a single vacuum pump operated by the flow of water from a faucet, or a vacuum pump operated by an electric motor. The liquid to be filtered is poured into the upper container and is drawn through the filter paper into the lower container by the vacuum. The filtrate can then be either left in the lower container to be drawn from when a quantity is required or it can be drained into large bottles for storage thereby making the unit available for another operation.

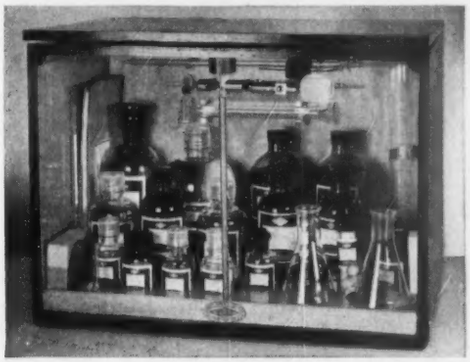
The Filco Vacu-Filter can be manufactured for any capacity that may be required, and it can be made of any metal which is most suitable. The unit can also be made of an inferior metal and then Filcoted. Filcoting is a lining claimed to be inert towards acids, solvents, syrups, etc., over a wide range of temperature. It is a glass-like surface which will not crack or chip and can be easily cleaned and sterilized.

The filter is equipped with a light weight cover for the top container, vacuum pump complete with hose and connections, special drain valve in lower container and stand.



Acid Filter

LaMOTTE CONTROL EQUIPMENT
for the
ELECTROTYPER and ELECTROPLATER



LaMotte Outfit for the Control of Acid Copper, Cyanide Copper, Acid Zinc, Cadmium, Brass and Bronze Plating Solutions.

Here is a compact unit which contains all necessary calibrated glassware, reagents and full instructions for making each test listed above. A specially designed working-cabinet is furnished in which the glassware and reagents are stored in their separate compartments offering the utmost in convenience and simplicity.

Other LaMotte Control Outfits are available for determining Chlorides, Nickel Content, Iron Content, Acid or Copper Content, the acidity and alkalinity of nickel, zinc, tin or cyanide baths.

Write for further information.

LaMOTTE CHEMICAL PRODUCTS CO.

Originators of the Practical Application of pH Control

DEPT. MF TOWSON, BALTIMORE, MD.

Proper Design

TO IMPROVE AND SPEED UP ANY SPRAYING OPERATION

Probably you often have encountered spraying problems which could be solved best by nozzles having definite spray characteristics. Or perhaps you have been undecided as to the kind of nozzle which would be best for a particular job.

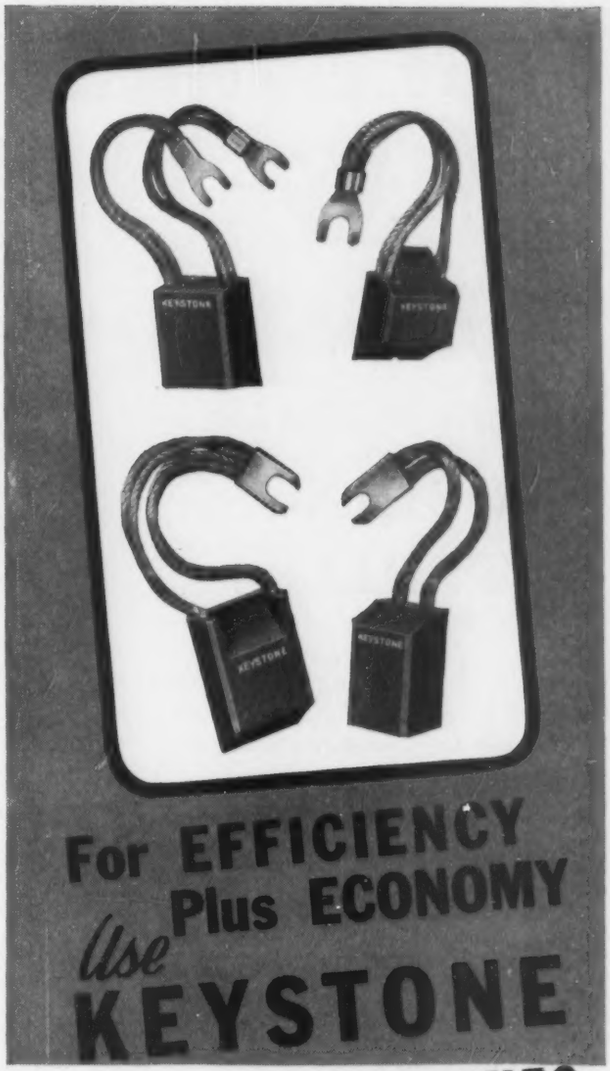
In either case, the answer can be found in the spray nozzles and cost-free engineering service you can get from Spraying Systems Company. We specialize in producing spray nozzles which perform to exact specifications—and our engineers have come up with answers to almost every conceivable kind of spraying problem.

It will pay you to find out just how properly designed nozzles can do a better, faster job for you. Write today for information and reference catalog.

SPRAYING SYSTEMS COMPANY

4039 West Lake Street Chicago, Illinois

SPECIALISTS IN THE DESIGN AND MANUFACTURE OF SPRAY NOZZLES



For EFFICIENCY Plus ECONOMY
Use KEYSTONE
Metal-Graphite BRUSHES

The high current carrying capacity of Keystone Metal-Graphite Brushes assure maximum operating efficiency. They have low contact drop which minimizes current loss and their excellent lubricating qualities provide smooth running. This high efficiency and long life result in economical generator operation.

There is a Keystone Brush for all standard types of Low Voltage Generators, Contact Roll and Slip Ring applications. We will gladly recommend the type best suited for your requirements.

Manufacturers of precision moulded products

KEYSTONE CARBON CO., INC.

1935 STATE ST. SAINT MARYS. PENNA.

DON'T TAKE CHANCES!

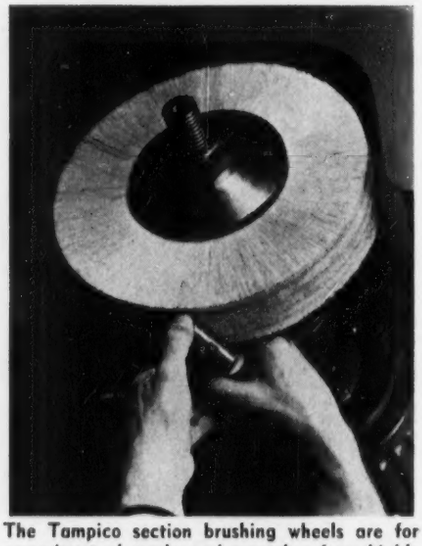
WHEN SELECTING FINISHING MATERIALS

★ Today you can't afford to take the least risk or chance in the selection of *any* material that affects the ultimate production of war equipment. If you do, you're gambling with time—and *time is not expendable!*

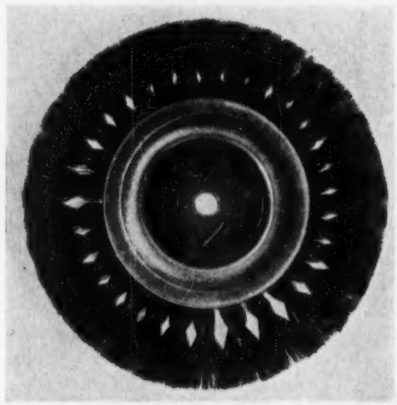
You can never recover or replace lost production finishing time. Every minute saved in the finishing of your product be it metal, plastic, wood or what-have-you, is a minute added to your increased output. Helping you conserve this precious time—helping you eliminate rejects, step up finishing production, cut operating and material costs, is the dedicated purpose of McALEER, men, methods and materials TODAY!

It is the *plus* you receive when you take advantage of *McALEER Advisory Service.* Brought to bear on your specific finishing problem it is the *plus* of protection you must have in order to *Produce Enough . . . in Time!* We want to work with you. *Let's get on with the job!*

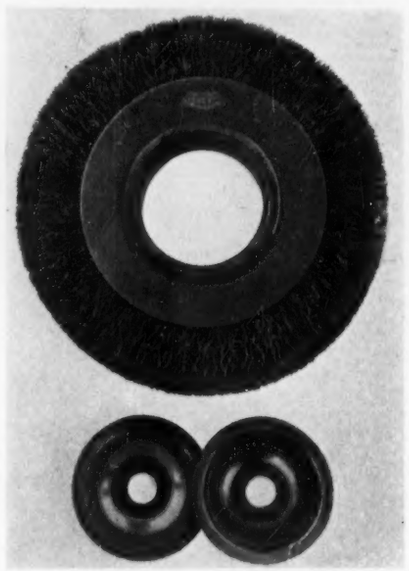
McAleer MANUFACTURING CO.
Quality-Controlled Finishing Materials
ROCHESTER, MICHIGAN



The Tampico section brushing wheels are for removing tool marks and scratches from highly stressed machine parts; for breaking corners and forming radii, and for gear cleaning, burring and polishing.



The Disc Center Wire Wheel sections are designed for high speed equipment and portable tools where extra-heavy brushing is required.



This Master Wheel is Osborn's most widely used wire brushing wheel, because it can do so many different jobs. Said to be easy to assemble on power shafts it has a dense face which makes it a long-wearing, fast-cutting tool. The wheel is shown with two adapters.

Manufacturers' Literature

Rotary Wire and Tampico Fibre Power Brushes

The wide versatility of rotary wire and Tampico fibre power brushes, produced by *The Osborn Manufacturing Co.*, Cleveland, O., manufacturer of industrial brushes, is described in two folders issued by the company.

Included among the Tampico fibre brushes are the special, chemically treated "Fascut" Sections, the Osborn Improved Tampico Ringlock Sections, the Monarch Tampico Sections, the Pierced Ringlock Tampico Sections and the Treated Tampico End Brushes.

Among the wire brushing wheels described in the folders are the Disc Center Wire Wheel Sections, Improved Monitor Steel Wire Sections, Riehl Steel Wire Sections, Pierced Ringlock Steel Wire Sections, and the Osborn Master Wheel.

Blackening Processes for Metals

The Enthone Co., New Haven, Conn., have just released an eight-page, illustrated folder in color, describing the "Ebonol" processes for blackening iron and steel, zinc and zinc alloys, copper and copper alloys, and aluminum and aluminum alloys. Characteristics of the coatings obtained, and general information on the processes, are given.

Operating Analysis Chart on Hydraulic Packings

A new operating analysis chart for the scientific specification and accurate shop record of hydraulic and pneumatic "U" packings has been issued by *Wayne Davies & Co.*, 325 West Huron St., Chicago, Ill. The chart, with complete conservation data, will be sent to packing users on request. A binder file can be set up in engineering and maintenance departments to control and record hydraulic packing service.

The bulletin with the chart goes into detail on the hydraulic service improvements developed by Wayne Davies with data and information enabling maintenance engineers to determine requirements and dimensions for every condition, for easy record on the accompanying form.

Temperature and Pressure Recording Controllers

A new catalog, Number 1200, entitled TAG Indicating and Recording Controllers for Temperature and Pressure, has been published by the *C. J. Tagliabue Mfg. Co.*, Dept. MF, Park and Nostrand Aves., Brooklyn, N. Y.

This 40-page book is a comprehensive presentation of three types of controllers—**On-Off, Throttling and Automatic Reset.**

The Adjustable On-Off model is the most popular type on industrial applications where time lag is small and heat capacity is large.

The Full Range Throttling model is recommended for use on applications of considerable process lag, or of small heat capacities. It is also suited to processes where load changes are small and of short duration.

For more difficult control applications, where large load changes extending over long periods are encountered, the Full Range Throttling model with Automatic Reset is suggested.

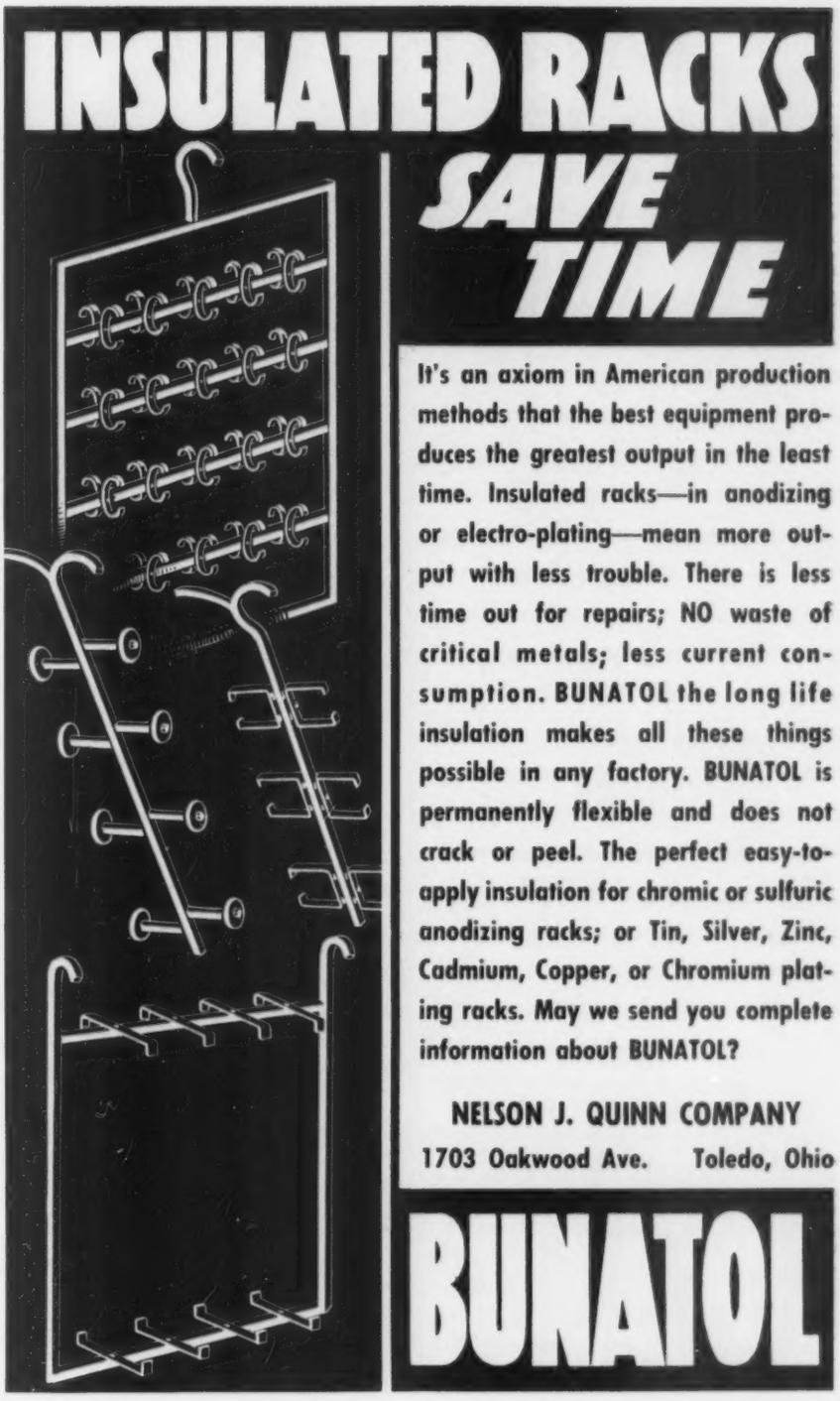
The many illustrations in the book show how these pressure-spring controllers operate, and photographs are given.

Lead Plating

Harshaw Chemical Co., 1945 East 97th St., Cleveland, O., have just issued an 8-page booklet for lead platers designed to answer their questions about lead plating with the company's fluoborate lead concentrate.

In addition, the booklet considers such subjects as the kind of tank to be used, the thickness of deposit, voltages, current densities, temperatures and solution control.

Tabular matter is included.


INSULATED RACKS
SAVE
TIME
It's an axiom in American production methods that the best equipment produces the greatest output in the least time. Insulated racks—in anodizing or electro-plating—mean more output with less trouble. There is less time out for repairs; NO waste of critical metals; less current consumption. BUNATOL the long life insulation makes all these things possible in any factory. BUNATOL is permanently flexible and does not crack or peel. The perfect easy-to-apply insulation for chromic or sulfuric anodizing racks; or Tin, Silver, Zinc, Cadmium, Copper, or Chromium plating racks. May we send you complete information about BUNATOL?
NELSON J. QUINN COMPANY
1703 Oakwood Ave. Toledo, Ohio
BUNATOL

Tank Linings

A catalog section on its new sheet Koroseal linings for tanks made of welded steel, wood or concrete, has just been published by *The B. F. Goodrich Co.*, Akron, O., and is available upon request. Use of the material is made possible by bonding methods recently announced.

The catalog section points out that Koroseal, because of the physical qualities which make it resistant to many strong corrosives, such as nitric and chromic acids, has extended the field in which tank linings may serve, fields in which rubber had been barred because of its physical limitations.

Koroseal, a plasticized polyvinyl chloride developed in B. F. Goodrich laboratories, is a synthetic elastic with many rubber-like qualities.

Most important feature of the catalog section is two pages devoted to tables showing the chemical resistance of the Koroseal linings to solutions of inorganic acids, solutions of inorganic salts and alkalis, plating solutions and organic materials.

Advantages of Koroseal linings in various types of service are outlined, as well as the limitations of the material. On this latter point the catalog section points out that company engineers must have complete details on service conditions before they can recommend use of the material.

MASKING PARTS *for Accurate* HARD CHROME PLATING

Miccro *Supreme*

STOP-OFF LACQUERS

Can be trimmed cleanly and sharply, providing extremely accurate plating work. Adhesion prevents creeping of solution under any portion of protected surface.

WRITE FOR FULL DETAILS

Developed and Manufactured by Experienced Platers

- Exceptional adhesive qualities but can be removed easily after plating. Conform perfectly to all irregular surfaces.
- Can be quickly and easily applied either by brushing or spraying. Rapid air-drying qualities reduce to a minimum time between coating and preparation for plating.
- As material is absolutely neutral and not contaminated by acid or any other destructive substance, there is no possibility of etching in precision, lapped or super-finished machine parts.
- Provide greater dielectric strength . . . resistance to breakdown or electrolytic action in heavy deposits . . . resistance to plating solutions and cleaning agents used prior to plating.
- Have no toxic properties. Can be used without ventilating systems, etc.
- Also suited for coating permanent hard plating racks.

MICHIGAN CHROME & CHEMICAL CO.
6348 EAST JEFFERSON • DETROIT, MICHIGAN

Use and Care of Fire Extinguishers

A new booklet entitled "Maintenance of First Aid Fire-Fighting Equipment," has been issued by *American-LaFrance-Foamite Corp.*, Elmira, N. Y.

The booklet is divided into six sections: (1) Vaporizing Liquid, (2) Soda Acid, (3) Foam, (4) Anti-Freeze, (5) Carbon-Dioxide Extinguishers, and (6) up-to-date charts giving complete data in condensed form as to extinguisher and engine characteristics, methods of operation, capacity, range of stream, etc.

Inspection, upkeep, charging, discharging, and recharging are all discussed, with emphasis on the periodic practice-handling and discharge of the units under simulated fire conditions.

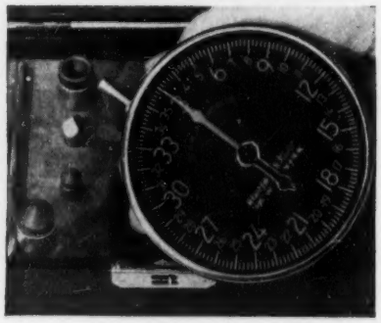
The booklet is free upon request.

Conveyor Literature

The newest *Alvey-Ferguson* catalog is entitled "Conveyors That Are Helping Bring Victory Faster!" It features pictures and describes in six pages of wartime illustrations the company's "scientifically-planned" conveyors for efficient indoor transportation of cartridges, component cartridge parts, shells—from billet to melt load building, shells filled with chemicals, hot drop forgings for tanks, tank treads, etc., airplane parts, engine parts, bombs and miscellaneous metal products.

This new, colorful folder is offered free, especially to government officials, army and navy officers, war plant superintendents, plant managers, purchasing agents, works foremen, etc. Address *The Alvey-Ferguson Co.*, 693 Disney Street, Cincinnati, Ohio.

Hand Tachometers



The Herman H. Sticht Co., Inc., 27 Park Place, New York, N. Y., have issued a bulletin, No. 790, which describes their Model J single range hand tachometers.

These tachometers are of the centrifugal mechanical type and indicate speeds and changes of speeds of any revolving shaft or surface continuously and instantaneously. They are instruments primarily designed for heavy duty service.

The tachometers have an open 4" dial with white figures on a black background, and come with a complete set of accessories and case. Six different ranges are available for speeds from 100 to 10,000 RPM.

Bright Zinc Plating Methods

A 14-page technical report on bright zinc plating as a substitute for cadmium plating has just been issued by *Turco Products, Inc.*, 6135 South Central Ave., Los Angeles, Calif. A mimeographed report, it gives complete descriptions of still and barrel plating, using a choice of three pre-cleaners, Turco Penetrol, Turco Supertrol or Turco Composition L-570, and, as the final cleaner, Turco Porokleen.

Because the supply of cadmium is critical, even for the most essential operations, cyanide zinc plating is replacing cadmium plating in many industries. According to the report, the new zinc cyanide baths have a relatively high throwing power, provide a corrosion-resistant plate as effective as cadmium, and produce an attractive bright plate.

Since successful adhesion of electroplated deposits depends upon a chemically clean steel surface, a pre-cleaner is essential to remove oil, grease, metallic oxides, mill scale and corrosion products, the report states. Which pre-cleaner will be used depends upon plant facilities, the type of work to be cleaned and other operating conditions.

Turco Porokleen, a final cleaner for plating, can be used either in a still tank or in electrocleaning. Both methods are outlined in the report.

Convertible Air-Operated Controllers

An eight-page bulletin, No. A112, has been published by the *Bristol Company*, Waterbury, Conn., describing a line of new convertible free-vane air-operated controllers recently developed. Data are given on the five types of controllers offered along with information on converting from one type to another.

Safety Equipment Conservation

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa., have published a comprehensive 32-page handbook entitled "How to Make Your Safety Equipment Last Longer."

Covering every type of personal protective equipment, from protective hats, gas masks, respirators and gas instruments, through safety clothing, this well-illustrated publication details the practical "do's and don'ts" of safety equipment care for key personnel, in a form readily adaptable for instruction of equipment users.

The book is illustrated throughout by marginal drawings pertinent to the text.

Properties of "Ameripol D"

A revised edition of its catalog section on "The Properties of Ameripol D," its oil and heat resisting synthetic rubber used in many specialized industrial applications, has just been published by *The B. F. Goodrich Company*, Akron, O., and is now available.

The catalog section discusses the properties of Ameripol D, including its resistance to various substances which are the enemies of natural rubber, hardness, tensile strength, elongation, weight, color, odor and taste, elasticity and permanent set, resistance to tear, abrasion, flexing, oils, solvents, etc.

Two pages are devoted to listing in table form the properties of the various compounds of Ameripol D, including a rough guide indicating the services where use of the synthetic rubber is practical.

Cleaning Catalog

Frederick Gumm Chemical Co., Inc., Dept. MF, 538-542 Forest St., Kearny, N. J., have issued a 32-page catalog entitled "Clepo Cleaning Catalog." Among the subjects discussed are descaling, cadmium and zinc plating, aluminum deburring, spot welding aluminum, aluminum anodizing, Parkerizing and Bonderizing, steel projectile cleaning, steel shell case cleaning and munitions deburring.

Blackening Iron and Steel

The Enthone Co., Dept. MF, New Haven, Conn., have issued a four-page folder of operating instructions for the use of the company's Ebonol "S" in a process for blackening iron and steel.

Equipment necessary for the operation of the process, making up the solution and controlling its temperature, and the steps involved in the procedure are discussed.

Cleaning, Descaling, Derusting, Paint Stripping

Specially prepared for plant superintendents, safety engineers, works managers and other maintenance executives, the newly enlarged, third edition of a 12-page digest, just issued by *Oakite Products, Inc.*, Dept. MF, 18 Thames St., New York, N. Y., presents concise information in data sheet form on cleaning, descaling, derusting, paint stripping and other related techniques and procedures now being successfully used to expedite 54 different factory and mill maintenance jobs.

Formulas and methods are given for simplifying and speeding-up a wide range of work common to practically all plants engaged in war work or essential civilian industries. Among the jobs described are removing lime-scale and rust deposits from water-jacketed spot-welding machines and dynamometers; cleaning machine tools, die casting machines, metal washing machines, etc.; reconditioning gas welding and flame cutting tips; cleaning paint spray booths and equipment; safely cleaning and de-scaling heat exchangers, condensers, coolers, compressors, Diesel and gas engine cooling systems; washing concrete, wood and other type floors; cleaning air conditioning and electrical equipment; and other maintenance jobs.

Pulley Lagging

Victor Balata & Textile Belting Co., Dept. M.F., Easton, Pa., the manufacturers of "Grip-On", have issued a new circular which fully describes their new type of pulley lagging and the most efficient methods of applying it to the pulleys.

Widely extended uses are reported for the lagging which, it is claimed, has a special wartime appeal because it conserves both power and belts. The pile-face surface, designed to promote better traction and longer belt life, is woven as an integral part of the lagging body, yet imparts no tension strain to the base—which maintains a snug fit on the pulley. This solid woven base prevents bolts or screws from pulling out.

Two Houghto - Black tanks in foreground. Houghto - Clean tank at extreme left.

SOME PARTS NOW BEING BLACKENED

Bicycle parts
Bottle caps
Carbine parts
Dies
Drills and bits
Gun mount parts
Hinges
Machine gun clips
Nuts and bolts
Propeller parts, steel
Radio parts
Spark plug bodies
Stirrup pumps
Tools
Typewriter parts
Washers

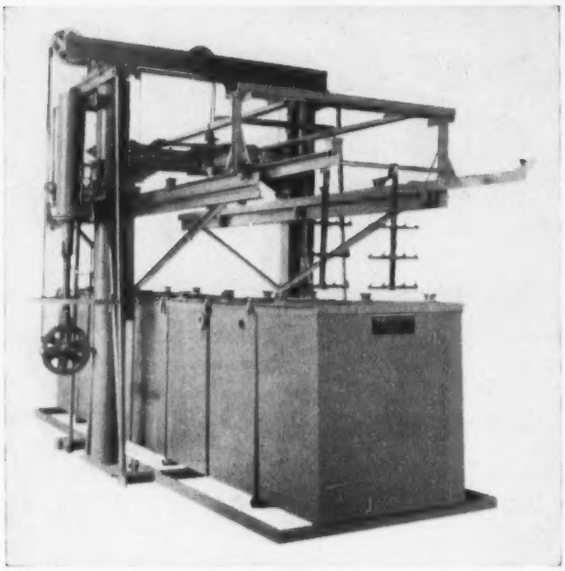
A PROVEN SUCCESS FOR PRODUCTION LINE BLACKENING

The HOUGHTO-BLACK process fills a definite need in the metal industry today. The fact that it does not change dimensional sizes permits its use as a finish on moving metal parts where no changes in tolerances can be allowed. Duplication of shades of black in correctly controlled baths permits mass production of parts made at different times. Other advantages are the low cost and simplicity of this low-temperature, oxidizing process plus its wide application to the rigid requirements of war materiel. It will pay you to investigate HOUGHTO-BLACK! Ask the Houghton Man or write for factual folder.

E. F. HOUGHTON & CO.
PHILADELPHIA
Chicago • Detroit • San Francisco • Toronto

WRITE FOR THIS FOLDER
CONTAINS FACTUAL DATA EXPLAINING
HOUGHTO-BLACK PROCESS

Crown Pick-up Unit



...MACHINE...

A UNIT TYPE TRANSFER CAPABLE OF HANDLING SEVERAL TANKS AT ONE TIME.

●

...USE...

FOR A SERIES OF OPERATIONS WHERE THE WORK MUST PASS THROUGH SEVERAL TANKS, AS THE CLEANING AND RINSING OPERATIONS, FOR A SEMI-AUTOMATIC PLATING TANK.

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Technical Literature

Chromium Plating on Steel

A.S.T.M. Committee B-8 on Electrodeposited Coatings previously developed a number of important specifications covering various types of coatings on steel, copper, and zinc alloys and has developed the test for local thickness of electrodeposited coating. Its most recent work involved agreement on recommended practices for various types of plating. The new Tentative Recommended Practice for Chromium Plating for Steel for Engineering Use (B 177-43 T) is the first of a number of such standard practices which will be issued. The scope of the recommended practice is as follows:

This recommended practice is presented as an aid to such platers and engineers who, although familiar with ordinary plating practice including decorative chromium plating, are confronted with new problems inherent in the deposition of chromium for engineering use. It is not intended as a standardized procedure but merely as a guide to the realization of smooth, adherent coatings of chromium of desired thickness and to the retention of the required physical properties of the steel base.

In this specification are discussed the nature of the steel with particular reference to its hardness, procedures for cleaning and etching prior to chromium plating, construction of racks and anodes, the chromium plating operation itself, subsequent treatments of the coating and repair of worn coatings, and finally test methods.

It is believed that this specification will be of real assistance especially to platers and engineers who have only a scanty knowledge of the factors involved in successful "hard" plating.

Copies of this specification may be obtained from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa., at 25 cents per copy.

A collection of other plating standards, including standards for zinc and cadmium plating and methods of tests on plated coatings, may also be had for 25 cents per copy.

1942 Book of A.S.T.M. Standards, in Three Parts, Has 1090 Specifications and Tests, 4900 Pages

The recently completed 1942 Book of A.S.T.M. Standards, issued in three parts, contains in their latest approved form all of the Society's widely used specifications and tests for materials, definitions, and recommended practices. One of industry's most important books, the latest edition has 1090 specifications and standard methods which cover more than 4900 pages.

Continuing the policy first used with the 1939 book, the latest edition gives all specifications, whether formal standards or tentative. It is issued in three parts, the divisions being as follows:

Part I. Metals. — Ferrous and non-ferrous metals (all A and B and some E serial designations) except methods of chemical analysis. General testing methods of chemical analysis. General testing methods (E serial designations).

Part II. Nonmetallic Materials—Constructional.—Cementitious materials, concrete and aggregates, masonry building units, ceramics, pipe and tile, thermal insulating materials (all C serial designations). Timber and timber preservatives, paints, varnishes and lacquers, road materials, water-proofing and roofing materials, soils (certain D serial designations). General testing methods, thermometers (E serial designations).

Part III. Non-metallic Materials—General.—Fuels, petroleum products, electrical insulating materials, rubber, textiles, soaps and detergents, paper, plastics, water (remainder of D serial designations). General testing methods, thermometers (E serial designations).

Part I contains many specifications on electrodeposited and hot-dipped coatings. It also includes many methods for determination of coating thickness and uniformity and procedures for performing salt spray tests. This volume is highly recommended for the plating chemist and engineer.

Part II contains specification for paints, lacquers, oils, thinners, driers and other paint and lacquer products. It also includes the testing of paints and will be of particular interest to the organic finisher.

(The Society is also issuing a new edition of its volume of chemical analysis of metals, including 21 widely used standards for both ferrous and non-ferrous metals. This book will be issued later in 1943. These methods are not included in the Book of Standards.)

Each part of the 1942 Book has a complete subject index. The Part II Index, for example, covers 32 pages, and there are two extensive tables of contents, the first lists all standards under general materials headings; the second lists them in order of the sequence of the serial designations. These features are intended to facilitate reference to any subject covered. Some idea of the large increase in the books is indicated from comparative figures for the 1939 volume. (Publication of the books is triennial.)

1939—866 Standards—3700 pages.
1942—1090 Standards—4900 pages.

1943-1944 *Supplements. Detailed Index*

To keep the books up to date in 1943 and 1944, a supplement will be issued to *each* part in *each* of these years. As a service with the 1942 Book of Standards there is a complete 200 page Index to Standards, which is furnished without additional charge and a copy accompanies the purchase of each part or complete set.

Sales Price, Including Supplements

The cost of each Part is $9; the charge for Supplements is $3 for *each* part, *each* year. For half-leather binding add $1 extra for *each* part and each Supplement part.

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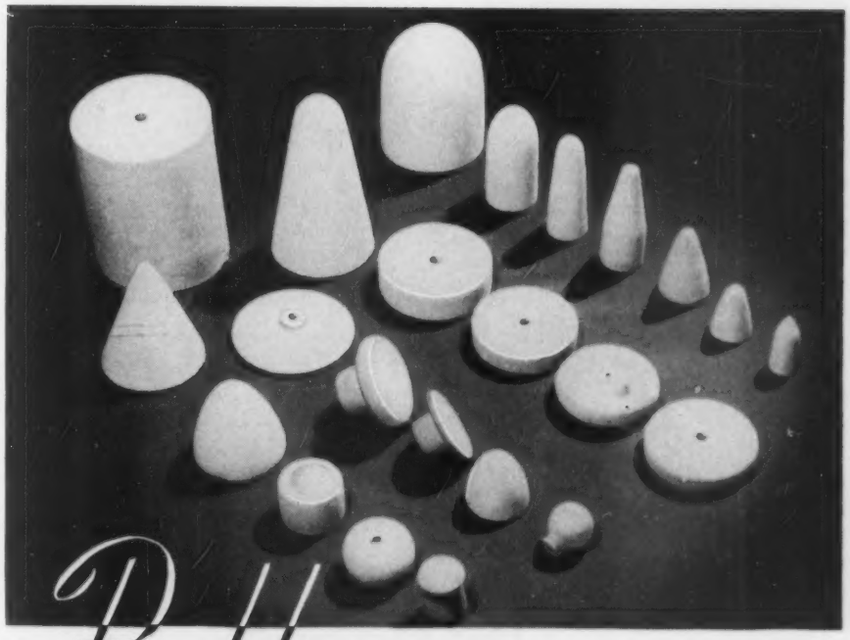

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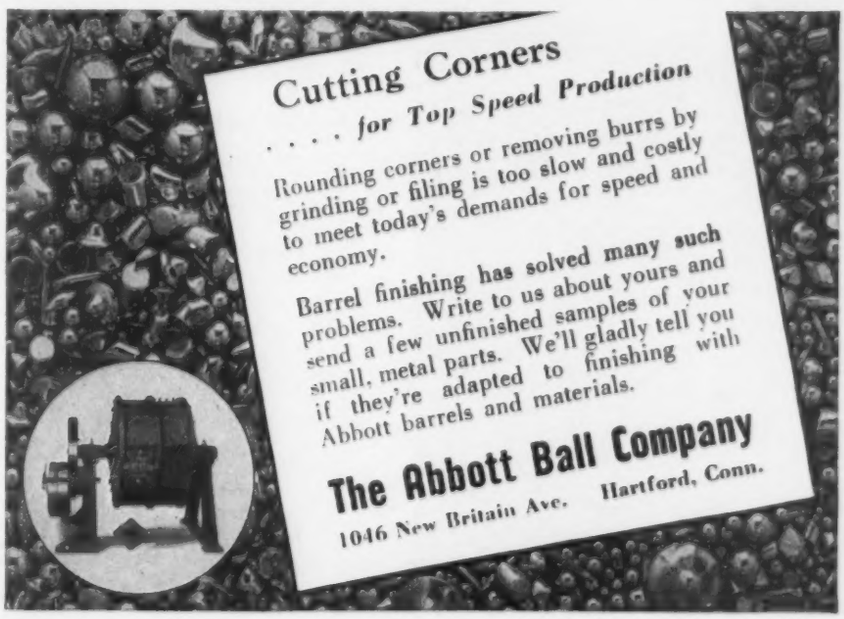
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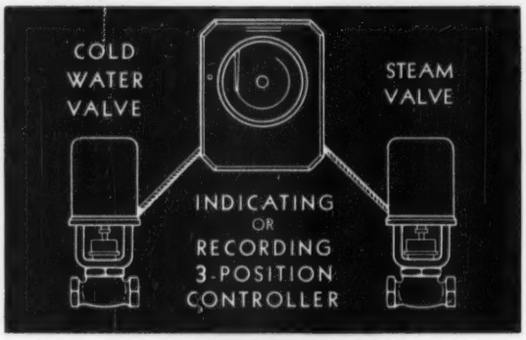

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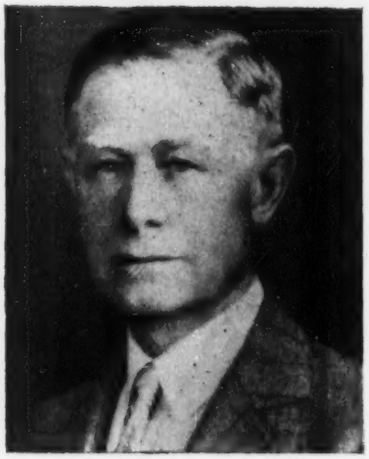
Obituary



Philip Sievering

Philip Sievering, founder and president of Philip Sievering, Inc., 199 Lafayette St., N. Y., and an outstanding leader in the electroplating industry, passed away on Tuesday, May 4, 1943, at the age of 79. The cause of his death was a cerebral hemorrhage. Mr. Sievering was active to the last.

Philip Sievering was born in 1864. He started work at an early age and while still a youth learned the trade of electroplating, rising to the post of foreman of the plating and finishing department of the Singer Manufacturing Co., Elizabeth, N. J.

In 1889 he founded the firm of Philip Sievering, Inc., the original force consisting of one man (himself) and a boy. From the original plant covering about 500 sq. ft., his company has grown through 54 years of continuous operation, to its present plant of 60,000 sq. ft. and a force of over 250 men. It is the largest contract electroplating company in the eastern United States and one of the largest in the world. Its work includes every type of metal finish: electroplating (still and barrel), polishing, lacquering and enameling, metallizing, rust-proofing and black finishes on iron and steel, acid dipping and chemical coloring, electrolytic polishing, Alumilite colors on aluminum and Alzak mirror finishes on aluminum.

Philip Sievering was a Past Supreme President of the American Electroplaters' Society, a member of the Research Committee of that Society, a member of The Electrochemical Society, a Master Mason and a Shriner. He was also a charter member of the Masters' Electro-Plating Association. He was active in trade, technical and civic movements for the improvement of his industry and his community. He gave freely of his time, his personal effort and his funds to good causes.

On December 16, 1939, Philip Sievering was tendered a banquet by the Masters' Electro-Plating Association to celebrate the fiftieth year of continuous operation of his company. At that dinner, Mr. Sievering was honored by representatives of his customers, his suppliers, his competitors, his employees and the National Bureau of Standards with

which he had cooperated for many years.

Mr. Sievering leaves a widow, Mrs. Mary B. Sievering; two daughters, Viola C. Sievering and Rose M. Sievering, and four sons, three of whom are active in carrying on the business: Philip Sievering, Jr., treasurer and general manager; Harry Sievering, vice-president and sales manager, and Nelson Sievering, secretary and technical manager. The fourth son, Howard, is serving in the armed forces as First Lieutenant, Signal Corps, attached to the Aviation Division.

Philip Sievering will be sadly missed by hundreds of personal and business friends. His integrity was proverbial: "Phil's word is as good as a certified check from anyone else."

Associations and Societies

American Electroplaters' Society
Los Angeles Branch

A talk by *James P. ApRoberts*, aircraft process engineer, on "The Fluoborate Lead Plating Bath" highlighted the educational session of the May 3 meeting of Los Angeles Branch, American Electroplaters' Society.

In his introductory remarks, Mr. ApRoberts discussed general facts about lead plating, and explained that in perfect coating of lead it is the freedom from pin holes rather than the thickness or weight of lead per square foot which is the real criterion for the protective value of the lead deposit.

Mr. ApRoberts stated that the fluoborate bath is the most widely used for lead plating. He declared that, in comparison with the fluosilicate bath, it provides denser, finer-grained deposits, is less susceptible to decomposition, and gives a satisfactory plate directly on iron or steel.

An advantage of the fluoborate bath, Mr. ApRoberts pointed out, is the ease of preperation and the reasonable cost of the fluoboric acid.

Describing the method of preparation, he said that the boric acid should be added slowly to the hydrofluoric acid and diluted with an equal quantity of water in a hard rubber or lead vessel. He advised that care be exercised because of the heat generated and warned that a too rapid mixing would result in volitization and loss of acid. The mixture, the speaker advised, should be allowed to cool to room temperature, after which the basic lead carbonate, or white lead, in the form of a thick paste with water should slowly be added with stirring to the cool fluoboric acid. After the insoluble matter has settled, the clear solution should be siphoned off or filtered and then diluted to the required volume. The glue, Mr. ApRoberts stated, should be dissolved in a small quantity of water and stirred into the electrolyte, and the bath will then be ready for use.

The speaker also discussed current density determination and offered some comment on the amount of glue to be used. He said that there must always be a com-

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EDWIN F. BAKER

As we go to press, the death of Edwin F. Baker, professor of chemistry at the University of Michigan, is sad news to the industry.

Dr. Baker, whose paper entitled "The Rate of Saponification in Metal Cleaning—a Preliminary Study" is scheduled for presentation on June 9th at the A.E.S. Convention in Buffalo, suffered a heart attack on May 14th and was confined in a New York hotel. He died May 26th.

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promise on the quantity of addition agent due to the fact that while smoother deposits are obtained with larger quantities, the deposits become harder and more brittle as the agent is increased. He also pointed out that it has been found that the accumulation of glue residue in the bath may finally become injurious.

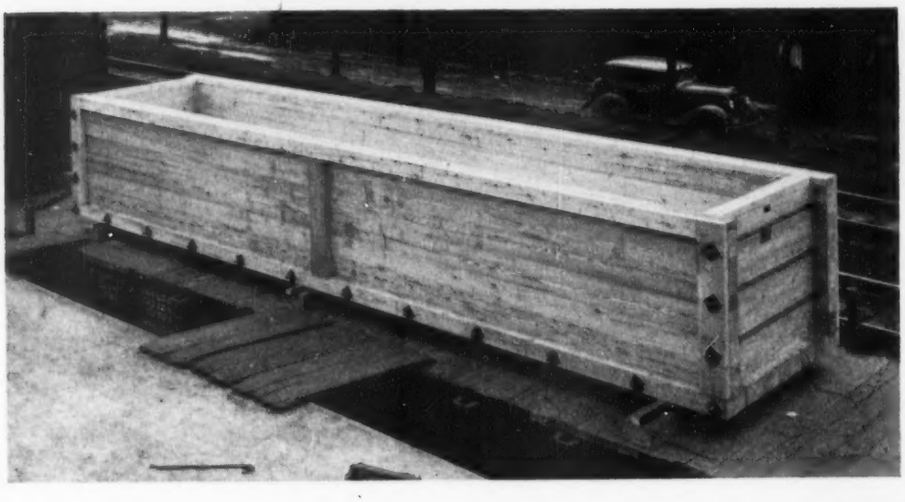
On the subject of current density, he said that the current density that can be used depends upon the required thickness and porosity of the deposit, the concentration of the solution and the degree of agitation or stirring. Mr. ApRoberts conceded that each plater must decide for himself the current which best fits his requirements. He said that while as high as 80 amp./ft.^{2} can be used, lower current densities are usually advisable, such as 10-20 amp./ft.^{2}.

The business session of the meeting began with the initiation of two new members for which a new and impressive initiation ceremony was used for the first time. The ceremony was prepared by a committee composed of *Frank Bunker, Earl Coffin* and *Stanley Rynkofs*. Mr. Bunker served as master of ceremonies at the initiation of *Frank Graeme* of the *Phelps-Dodge Corp.* as an active member, and *Carl Hirdler* of *Turco-Products, Inc.*, as an associate member. The membership agreed it was the most impressive initiation ceremony ever conducted by the branch.

Mr. Bunker also served as master of ceremonies at the installation of the new officers which had been elected at the April meeting. *Emmette R. Holman* was installed as president; *Joseph Sunderhaus* as first vice-president; *Ed Wells* as second vice-president; *Earl Coffin* as librarian; *Stanley Rynkofs* as sergeant-at-arms, and *Ernest Lamoreaux, Don M. Bedwell* and *John Merigold* as members of the board of managers. *Carroll McLaren*, last year's efficient secretary-treasurer, was persuaded to continue in office for another year.

As delegates to the national convention, President Holman named *E. R. Williams, Carl Webber* and *John Merigold*, with *Ernest Lamoreaux, Marcus Rynkofs* and *Earl Coffin* as alternates.

Mr. Lamoreaux read the report of the board of managers for the fiscal year May 1, 1942, to April 30, 1943, which revealed the branch to be in sound financial condition, and membership totals holding up well under war conditions.



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The branch unanimously approved a resolution prepared for submission to the Buffalo convention, calling for a reduction in the per capita tax. The resolution pointed out that many branches barely make their books balance at the end of the fiscal year and that the per capita tax *increase* proposed by another branch recently would, for many branches, represent the difference between a profit and a loss. Proposing to *reduce* the per capita tax from 45c to 35c, the Los Angeles resolution declared the reduction would make it possible for branches to devote more money to educational programs and would reduce the Supreme Society' income by no more than about $800 a year.

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News From California

By FRED A. HERR

Faced with an M-10 rating on plating materials—which makes it about as easy to get as a third cup of coffee in a restaurant — Metro-Goldwyn-Mayer Motion Picture Studio has decided that the decorative finishes with which it has adorned its cameras and other equipment will have to be foregone for the duration of the war, and has discontinued the plating shop in its Culver City Studio.

Until the first of the year, MGM operated a well-equipped plating and finishing room which was tucked away in a corner of the huge laboratory building on the back lot. The shop kept several men busy on such tasks as gold and silver plating of camera parts, plating and polishing the reflectors of stage lights, and miscellaneous other work involving metal finishing. When it was definitely determined that an M-10 rating on priorities for strategic materials was the best that could be hoped for, the film company decided to discontinue its own plating operations, use camera parts unfinished, and try to make the supply of reflectors last out the war.

The plating room staff has been distributed among the personnel of other shops at the studio. *Ray Solivan*, chief plater, has been assigned to tool making in the camera machine shop for the duration of the war.

In consequence of the substantial reduction in the number of "B" films now being made, the amount of film developed by MGM has been reduced from 700,000 feet daily to approximately 500.000 feet. The studio now is concentrating on "A" films, placing the emphasis on quality instead of quantity.

Recovery of silver from hypo solution has been handled successfully by Hollywood studios for a number of years. At MGM's Culver City plant, the salvage of silver is achieved through the Hickman process, under which recovery cells fitted with carbon anode and stainless steel cathodes are immersed in the hypo solution. Studio technicians estimate that approximately 90% of the silver bromide which is present in film at the rate of 1400 ounces per million feet of film, is left behind in the hypo. While the studio was operating on the 700,000-foot per day schedule, it recovered approximately

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1943
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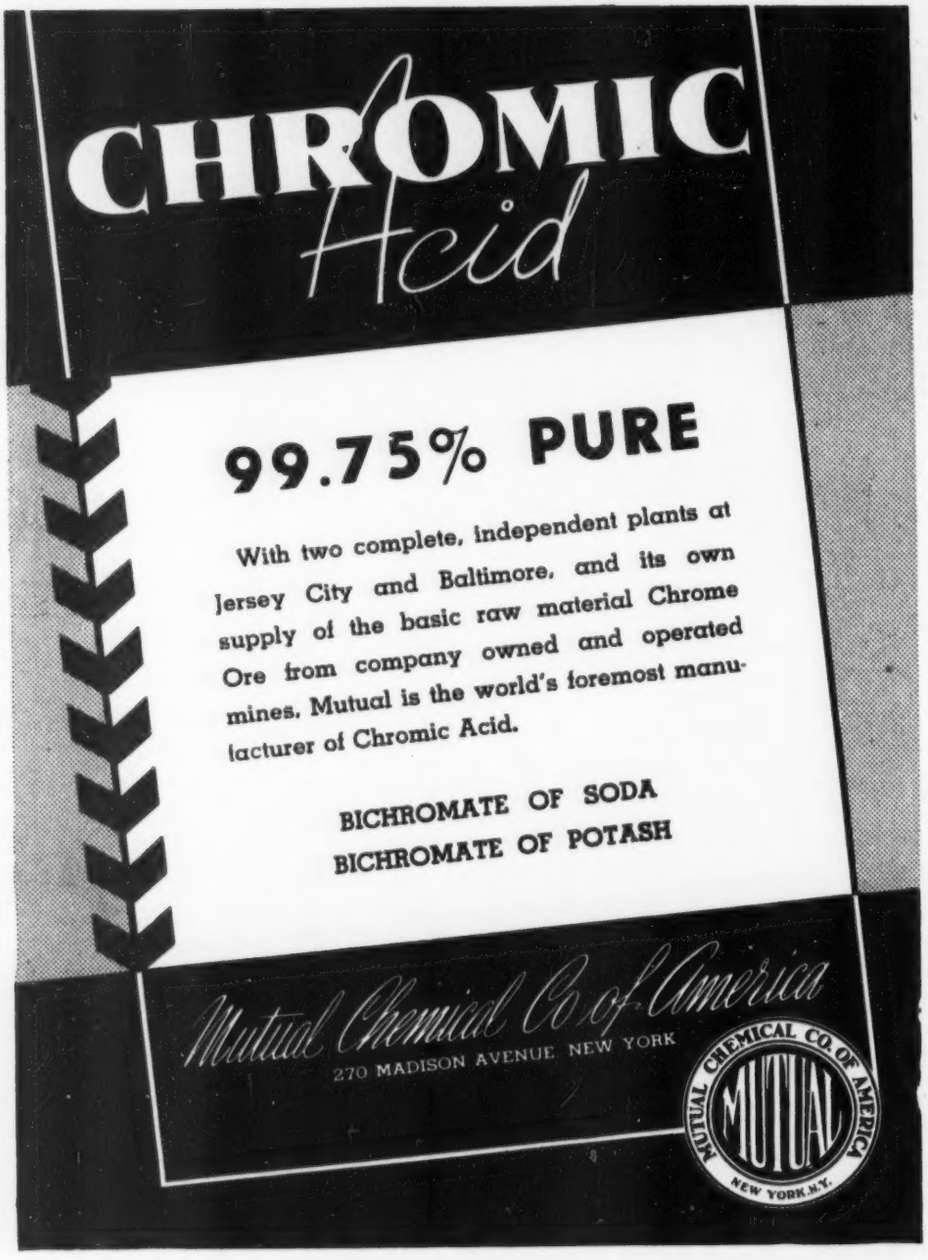
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250,000 ounces of silver per year, assaying 99% silver and 1% gelatin. The quarter million ounces represented the salvage of silver from 6,000 gallons of hypo solution which was constantly kept flowing through 14 developer tanks and eight silver recovery units.

The proportion of silver being recovered today is greater than in the pre-war period. This is due to the fact that the large amount of film which formerly had to be processed through the developers and recovery cells sometimes made it necessary to sacrifice efficiency for speed. With less film going through the laboratory now, greater emphasis can be placed on technical efficiency.

Under the 700,000 feet daily schedule (some days as high as one million feet) approximately 1250 of the 1400 ounces of silver present in each million feet of film were recovered by deposition of the silver bromide on the cathode plates of the recovery units. This represented 89.3% of the total silver. The recovery ratio today is approximately 94%.

Emmette R. Holman, chief chemist of *Turco Products, Inc.*, 6135 So. Central Ave., Los Angeles, spent his vacation in April taking a course in gas warfare at Occidental College, Los Angeles.

Advertisements carried in *Metal Finishing* by *W. Green Electric Co., Inc.*, of New York, on their Selectro-Platers brought so many inquiries from Southern California plating shop operators that the company has decided to appoint a west coast representative, with headquarters in Los Angeles.

Elmer I. Huppert, Jr., of the firm arrived in Los Angeles April 26 for an extended visit. He announced his intention of spending about six weeks in the area in order to thoroughly familiarize himself with conditions there, and to contact members of the industry in large and small plating plants. Mr. Huppert expected to name a company representative before returning to New York around June 1.

A paper entitled "Zinc—Saboteur of Steel at Elevated Temperatures," which was read at the 1943 annual educational session of Los Angeles Branch, AES, by *Franklin Page, Jr.*, laboratory foreman of the *Solar Aircraft Co.*, San Diego, impressed members of the convention committee of the Supreme Society so highly that the paper has been scheduled as a leading topic of discussion at the 31st annual convention of the AES at Buffalo, N. Y., June 7 to 9.

Mr. Page has been invited by the committee to read the paper personally at the Buffalo convention or, if he cannot attend in person, to send the paper and the film which illustrates it to the convention committee, which will have them presented by an assigned speaker.

Joan Trumbour, advertising manager of *Metal Finishing*, and daughter of the publication's business manager, *Thomas A. Trumbour*, was in Los Angeles on a business trip May 7 to 11.

Kenneth Pifer Dies in Service

Word has been received in Los Angeles of the death while on service with the U. S. Coast Guard in Alaska of *Kenneth Pifer*, former operator of the *Santa Monica Plating Co.*, Santa Monica, Calif. Kenneth took over management of the firm upon the death of his father, *E. C. Pifer*, two years ago. Until his enlistment in the Coast Guard in August, 1942, he and his mother had operated the shop. According to the report, Kenneth, aged 24, died as the results of injuries sustained in a fire and was buried in Alaska. His mother sold the plating company to the *Higgins Industries* several months after his enlistment.

Eighty-three electro-plating firms, 12 galvanizers and 161 wholesale and manufacturing chemists catering to platers are listed in the new 1943 edition of the Los Angeles extended area telephone directory, distributed in April.

Seventy-seven of the plating firms listed are in Los Angeles, three in Inglewood, one in Pasadena and one in Glendale. The listing discloses that hard chrome service is 'offered by seven firms; anodizing by eight; cadmium, 17; chrome, 11; bright nickel, eight; nickel, four; bronze, two; silver, 12; gold, eight; copper, nine; brass, four; zinc, seven; steel blueing, one; tin, one, and rhodium, one.

The listing does not represent the total number of independent plants equipped to provide those various services, since the majority of the companies are merely listed under firm name and address only with no detail as to their services. Zinc plating, for instance, is listed among the services offered by only eight companies, whereas it is known that more and more plating shops have installed zinc facilities in recent months to handle defense contracts involving items for which the government specifies zinc. While only 11 firms are listed as platers' suppliers, the number is misleading because most such firms are included among the wholesale and manufacturing chemical companies, and equipment-machinery distributors and producers.

A fire, caused by the explosion of an acid vat while heat-treating of alloy castings was under way, caused damage of several thousand dollars at the plant of the *North American Metals Co.*, 1400 Newton St., Los Angeles, on April 20. The speedy arrival of firemen from a station house only a block away was credited with stopping the fire before more serious damage was done.

The War Labor Board has granted wage increases to 353 employees of the *Baash-Ross Tool Co.*, 5512 Boyle Ave., Los Angeles. The increases, which were made effective as of last November 15, average 5c per hour for employees of the two machine and metal finishing shops operated by the company for the production of aircraft parts and oil field tools.

PRE-VIEW

of plating development

• DURING WAR
• AFTER WAR

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Brass Copper —their Alloys	*PERMAG Cupro-lyte* —Cathodic cleaner for these important war material metals, and their alloys.
Aluminum	*PERMAG Aluminum Cleaner* —For Aluminum prior to anodizing and finishing for other white metals, zinc and lead die-cast, etc.

Write us about your cleaning problems and we will send recommendations for obtaining the proper materials for your job. Our cooperative service is always ready to aid and advise.

MAGNUSON PRODUCTS CORPORATION
Manufacturers of Specialized Scientific Cleaning Compounds

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FOR
HARD CHROMIUM
USE
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ADDITION AGENTS
to obtain

1. Finer grain structure
2. More durable plate
3. Smoother heavy plate
4. Greater throwing power
5. Less sensitivity to sulphate ratio.

Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

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143 Exchange Street
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INDIAN BRAND
POLISHING ABRASIVE

A new type, long wearing, economical abrasive grain. Perfected and introduced by us as a substitute for imported Turkish Emery. Leading defense plants now using large quantities for essential war-work, report excellent results.

Send for trial lot—Free

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Hartford STEEL BALLS

Burnishing and polishing balls and mixtures. Absolutely guaranteed not to wear out through burnishing use

THE HARTFORD STEEL BALL CO
HARTFORD

Established 1901
ORIENTAL ROUGE CO., INC.
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ALUMINUM: cutting and coloring compounds.
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STERLING and SILVER PLATE: Rouges to fit your particular job.
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NICKEL, CHROMIUM, BRASS OR COPPER Electro-Bonded SHEETS • COILS TO ZINC, STEEL, BRASS, COPPER, ALUMINUM OR TIN PLATE

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Manufacturers of Electroplating, Buffing, Polishing Apparatus and Supplies.
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Chrome production has reached an all-time peak in Siskiyou County, Calif., with numerous properties active in the Callahan, Gazelle, Hamburg, Happy Camp, Dunsmuir, Orleans and Selad Valley districts. It is claimed that the Siskiyou County output of chromite could be doubled if adequate access roads and concentrating plants were provided. Old chrome properties recently opened in the Cecilville district by *T. E. Eldridge* are reported to have disclosed commercial grade chromite in four separate areas.

The Nevada-Massachusetts Co. has resumed churn-drilling of virgin ground in the Golconda tungsten property near Winnemucca, Nev. The new work is expected to materially increase the ore reserves built up through extensive drilling operations conducted in 1941, which resulted in the location of important scheelite deposits.

So-Cal Magnesium, Inc., has been incorporated at Los Angeles with 20,000 shares no-par stock by *Thomas Sheedy* and *T. D. O'Neil* of Los Angeles and *George Sheedy* of LaCanada, Calif.

Pacific National Laboratories, Inc., capital stock $20,000, has been formed at Los Angeles by *A. Modell, S. B. Jacks* and *Milton Krug.*

Other Southern California firms which recently received incorporation or fictitious firm name papers include the following:

Hycar Chemical Co., (Ohio corporation); capital stock $5,000; California agent, *Joseph C. Cannon*, Los Angeles.

Filtex Corporation, (Michigan corporation); capital stock $20,000; California agent, *Maurice A. Gale*, Belvedere, Calif.

Aircraft Tool Engineering Co., 12023 Ventura Blvd., North Hollywood Calif. Members, *Theodore Ulmer, M. A. Borman* and *Louis G. Fry.*

Micro-Boring Co., 1155 E. Florence Ave., Los Angeles. Members, *Stirling R. Garvis, T. W. Fields* and *B. H. Lancaster.*

Lee Davis Precision Machine Works, 2135 W. Manchester Ave., Los Angeles. *Harry W. Lee* and *Charles F. Davis.*

Aero Magnetic Laboratories, 4870 Santa Monica Blvd., Los Angeles. *James Babcock* and *P. A. Robinson.*

Crozier Machine Tool Co., 684 No. Prairie Ave., Hawthorne, Calif; *H. E.* and *C. P. Crozier.*

United Welding Co., 1223 University Ave., San Diego. *Charles L. Willis, Victor M. Ladroot* and *Louis R. Rugg.*

Aircraft Precision Parts, 11133 Hawthorne Blvd., Inglewood, Calif. *William W. Turner* and *Walter G. Hoffman.*

Business Items

Dr. Frank K. Schoenfeld has been named technical superintendent of the chemical division of *The B. F. Goodrich Company*, Akron, O., it is announced by *Arthur Kelly*, division general superintendent.

Dr. Schoenfeld goes to his new post after many years of specializing in the development and application of Koroseal. He had been, for several years, in charge of the Koroseal research and development laboratories. In his new post he succeeds *Dr. Robert V. Yohe*, recently named manager of the Kentucky synthetic rubber plant operated by the company for the government.

A native of Pittsburgh, Dr. Schoenfeld received his bachelor of science in chemistry degree from the University of Michigan, his master and doctor degrees from Western Reserve University. He has been with B. F. Goodrich since 1927.

Robert J. Green, manager of the plating division, has announced his resignation from *Alsop Engineering Corp.*, Milldale, Conn., to take a more active part in defense work. His new mailing address is 45 Prospect St., Waterbury, Conn.

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by Joseph Novitsky

- We specialize in plating racks of our own patent.
- Constructed without screws, rivets, solder, brazing, welding.
- We design racks to suit your individual problem.

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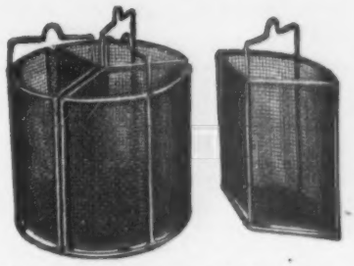
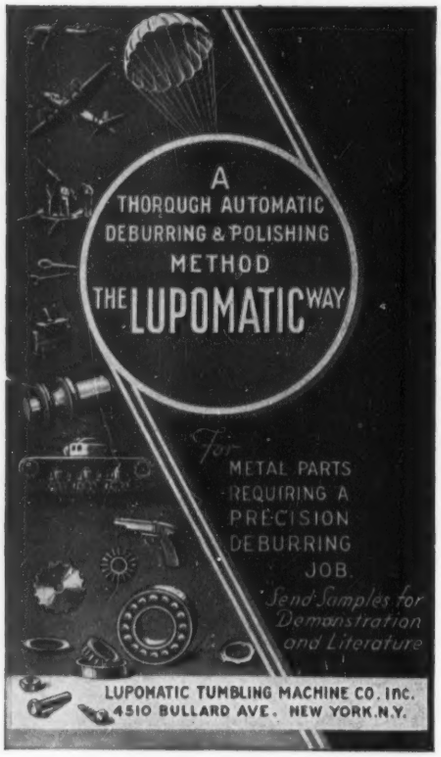


Rolock engineers designed this steel dipping basket in three sections to keep small quantities of different articles separate . . . and utilize existing limited tank space. This is but one example of Rolock specialized service which is solving innumerable carrier problems throughout the metal industries.

Check your methods in hardening, annealing, quenching, bonderizing, brazing, carburizing, cyaniding, or pickling processes . . . see if Rolock cannot show you carriers to speed the work by better handling. Write today.

ROLOCK, INC.
1300 Kings Highway East, Fairfield, Conn.



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BUFFING and BURRING COMPOUNDS ASSURE

The Best Quality, Correct and Uniformly controlled manufacturing, Fair Price Policy, and Special Formulas for Individual Demands.

WE PRODUCE

BURRING COMPOUNDS	All types
ROUGES (Iron Oxides)	(Quick wash) All grades
TRIPOLI	Numerous grades
EMERY PASTE	All size grains
COMPOUNDS	For every metal
GREASE STICKS	For better efficiency
LIME COMPOUNDS	Many formulas

—Let us send you some free samples—

The ROBERTS ROUGE COMPANY
STRATFORD CONNECTICUT

Ed Berry Leaves Udylite Forms Own Company

E. F. Berry, more familiarly known as Ed, has resigned from The Udylite Corporation and announces the formation of his own company known as the *Edward F. Berry Company*, 6432 Cass Avenue, Detroit, Mich. The new company will handle a complete line of supplies for plating, polishing, anodizing and metal finishing.

Ed Berry has been associated with the metal finishing industry since his graduation from the University of Pittsburgh in 1926. He was employed by the Aluminum Company of America, New Kensington, Pa., as research chemist and later, was editor of "Metal Cleaning and Finishing." He joined the Udylite organization in February, 1932, when that company was just entering the field of plating and polishing supplies and equipment. He has been intimately associated with the development of Udylite products since 1932.

The Plating Equipment & Supply Co., 182 Grand St., New York, N. Y., for fifteen years a source for used equipment for the polishing, plating, spraying, baking, cleaning and drying industries in the eastern metropolitan area, has announced the completion of its plans for the consolidation of its new supply and equipment division, with its used equipment branch.

Both divisions are now located at 182 Grand Street, a few doors away from the former new equipment branch, and one block away from the used machinery division.

At the new location, there is a larger office, an enlarged manufacturing and rebuilding shop, and 15,000 square feet of space for the display and sale of new and used equipment and supplies.

Parnall Promoted to Treasurer

The board of directors of *The Osborn Manufacturing Co.*, 5401 Hamilton Ave., Cleveland, O., producers of industrial brushes and foundry moulding machines, announce the appointment of *Arthur B. Parnall* as treasurer.

With Osborn for the past 17 years, Parnall has successively held the positions of chief accountant and controller.

He is a native Clevelander, married, and lives at 2541 Overlook Road, Cleveland Heights.

Parnall has been an active member of the National Association of Cost Accountants for many years.

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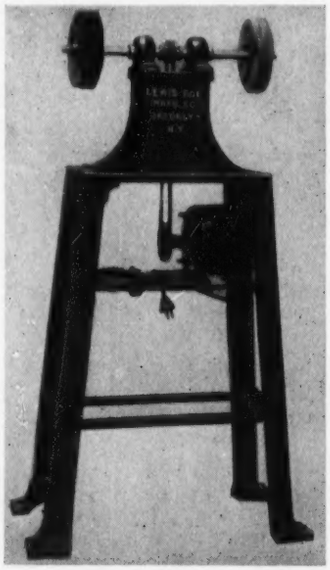
The Black Oxidized finish that penetrates Iron & Steel Surfaces

ECONOMICAL Inexpensvie equipment with minimum procedure.
CORROSION RESISTANT Will stand a 100 hour salt spray test.
NO CHANGE IN DIMENSIONS Parts remain same size after treatment.
NON - TECHNICAL Temperatures not critical. Analytical control not necessary.
PERFECTLY UNIFORM Beautiful ebony finish maintained throughout.

Write for descriptive folder

THE PURITAN MFG. CO.
Waterbury, Conn.



The polishing machine illustrated on this folder was designed for light buffing and coloring work and will take the place of heavier machines for this class of work. The machine is driven by a ¼" H.P. alternating or direct current driving motor mounted on the stand.

The machine is equipped with two self-aligning ball bearing pillow blocks and has a ¾" diameter spindle 22" long. Longer spindles can be furnished if required. The spindles are turned down at the ends to the diameter of one half inch and threaded eight square threads to the inch. The spindle is tapped for taper points which are furnished with machine.

A switch, eight feet of cord, a V belt and a device for keeping belt at a uniform tension are also furnished. Machine weighs approximately one hundred pounds and can be moved about the shop. Electric current to operate machine is approximately one cent per hour.

LEWIS ROE MFG. CO.
1042-1050 DE KALB AVE.
BROOKLYN, N. Y.

VULCAN SODIUM STANNATE

Manufactured by

THE VULCAN DETINNING CO.
SEWAREN, N. J.

Under Patents Nos. 1,575,217 and 1,708,392

FOR TIN ELECTROPLATING

SALES AGENT

The Electrochemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.

CADMIUM — ZINC — BRASS COPPER PLATING

SCREWS — RIVETS WASHERS—SMALL PARTS, ETC.

Quotations furnished promptly upon request.

SIMPRO CORP.
39 Ave. L, Newark, N. J.

At a recent meeting of the stockholders of *Handy & Harman*, 82 Fulton St., New York, N. Y., *Judson C. Travis* of Morristown, N. J., assistant to the company's president, was elected a director of the company.

The new post comes to Mr. Travis as he completes his 25th year of company service. Starting during the last war as an office boy in 1918, he was soon promoted to more responsible positions.

He has headed sales and advertising activities of Handy & Harman for many years and five years ago became assistant to *Mr. G. H. Niemeyer*, the company's president. In that capacity his principal efforts since the beginning of the war have been directed to the development of the company's rapidly expanded war activities.

Mr. Travis takes the place, on the Handy & Harman Board of Directors, of Mr. H. H. DeLoss, recently deceased.

W. B. "Bill" Muse has been appointed sales manager of *Industrial Abrasives, Inc.*, 3724 West 38th Street, Chicago, manufacturers of coated abrasive discs, according to an announcement by *L. H. Metzger*, president.

Mr. Muse was for several years sales manager of the *Sterling Tool Products Company*, of Chicago.

Appointment of *L. M. Harris* as general sales manager of the *Park Chemical Company*, at 8074 Military Avenue, Detroit, Mich., was announced by *F. Lloyd Woodside*, president.

The appointment, Mr. Woodside said, is an intra-organizational promotion, Mr. Harris having been sales manager of the automotive division of this industrial chemical manufacturer since 1939.

Mr. Harris entered the automotive industry in 1919 and has served in various executive capacities in the accessories field, as district manager for Willys-Overland and as a retailer.

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THE NATIONAL SHERARDIZING & MACHINE CO.
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SMALL PARTS, ETC.

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For a real good polishing job use

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Write for Sample

KEYSTONE EMERY MILLS, 4318 Paul St., Phila., Pa.

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Sheets—Rolls

Phosphor Bronze, Bronze Gilding Metal
Low Brass and Special Alloys

WATERBURY ROLLING MILLS, Inc.
Waterbury, Conn.

RIBBON ZINC
For stamping and drawing
FUSE METAL
For fuse elements
ZINC WIRE
THE PLATT BROS. & CO., Waterbury, Conn.

Supply Prices, May 24, 1943

Anodes

Prices are f.o.b. shipping point on quantities of from 500-999 lbs. for copper, brass and zinc. For nickel, prices are for quantities from 500-2,999 lbs.

COPPER: Cast, elliptical, 15" and longer ..... 25⅛c. per lb.
Electrolytic, full size, 22⅞c; cut to size .... 22⅞c. per lb.
Rolled, oval, straight 15" and longer 23¼c. per lb.; curved ..... 24¼c. per lb.
BRASS: Cast, 80-20, elliptical, 15" and longer ..... 23⅝c. per lb.
ZINC: Cast, 99.99, 16" and over ..... 16¼c. per lb.
NICKEL: 95-97 cast, elliptical 46c. per lb., 99% plus cast 47c.; rolled, depolarized ..... 49c. per lb.
SILVER: Rolled, .999 fine per Troy (100 oz. lots) .... 49½c. per oz.

Chemicals

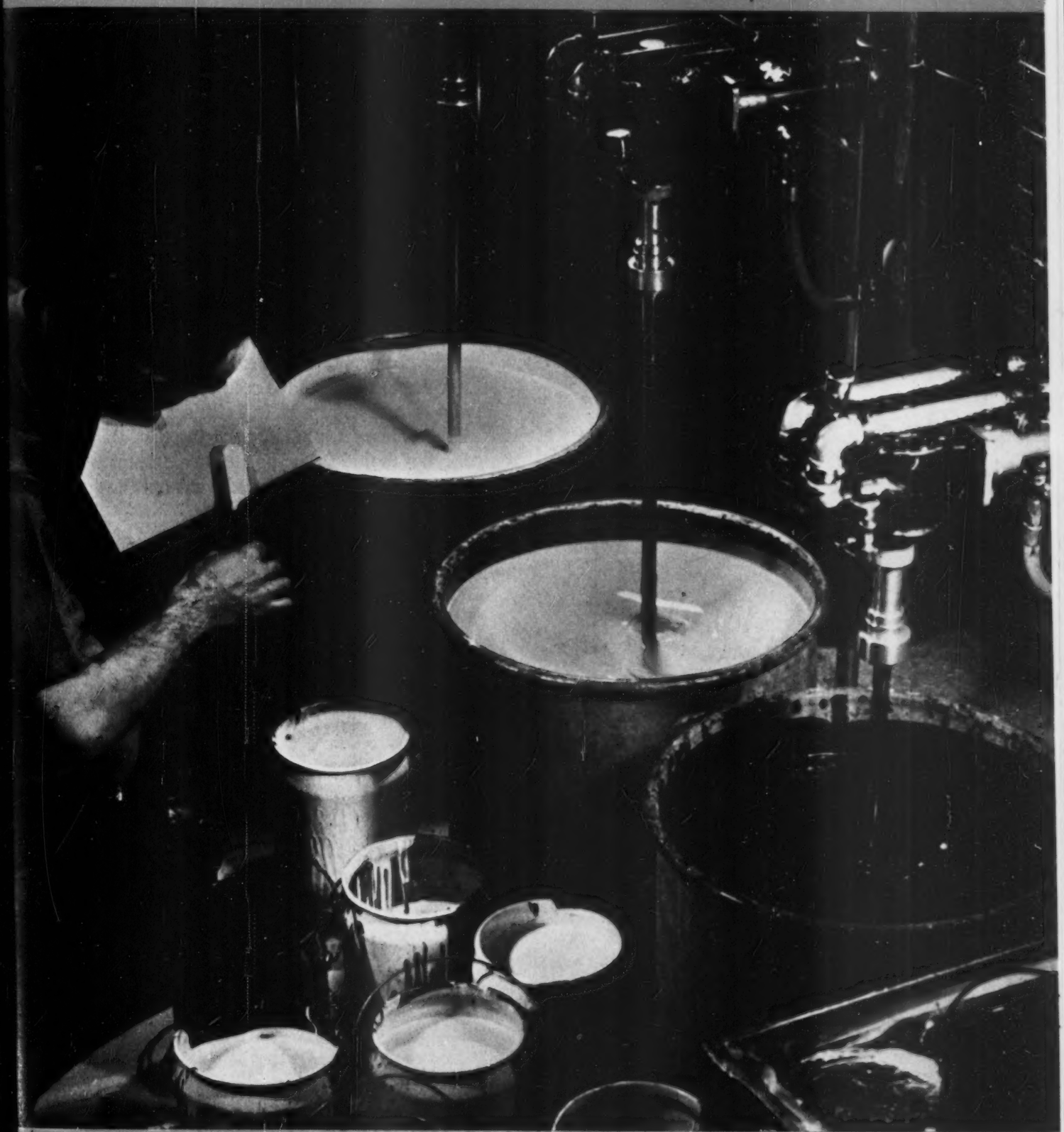
These are manufacturers' quantity prices and based on delivery from New York City.

Acetone, C.P., dms., l.c.l.	lb.	.09
Acid, Acetic, glacial, 99.5%, bbls.	lb.	.0940
Boric, tech., 99.5% gran., bbls.	lb.	.063
Chromic, 99%, 100 lb. dms., l.c.l.	lb.	.1725-.1825
Hydrochloric (muriatic) 20°, cbys., wks.	lb.	.0175
Hydrochloric (muriatic) C.P., 6 lb. bottles	lb.	.19
Hydrofluoric, 30% rubber dms.	lb.	.08-.09
Hydrofluoric, 48%, rubber dms.	lb.	.12
Nitric, 36°, cbys. 1-9, wks.	lb.	.0595
Nitric, 42°, cbys c.l., wks.	lb.	.065
Oleic (Red Oil), dms.	lb.	1325-.1425
Oxalic, small quantities	lb.	.125
Phosphoric, 75%, c.l., cbys.	lb.	.0510-.0535
Stearic, double pressed, bags	lb.	.15-.16
single pressed, bags	lb.	.145-.155
triple pressed, bags	lb.	.18-.19
Sulfuric, 66°, cbys., c.l., wks.	lb.	.015
Alcohol, Amyl (Fusel oil, ref'd), l.c.l.	lb.	.151
Butyl-normal, l.c.l.	lb.	.1225-.1575
Denat., S.D. #1, 190 pf., bbls., c.l., wks.	gal.	.62
Diacetone, tech., dms., l.c.l.	lb.	.115-.14
Methyl, (Methanol), synthetic, dms., l.c.l.	gal.	.37
Propyl-Iso, 99%, dms. l.c.l.	gal.	.47
Propyl-Normal, dms., wks.	gal.	.67-.70
Alum, ammonia, granular, bbls. wks.	lb.	.04
Potash, granular, bbls., wks.	lb.	.0425
Aluminum Sulfate, iron-free, bgs., c.l., wks.	lb.	.02-.0210
Ammonia, aqua, 26°, cbys.,	lb.	.0525
Ammonium, chloride (sal-ammoniac), white granular, bbls., wks.	lb.	.0515
Ammonium, Sulfate, dms. bulk	ton	$29.20
Sulphocyanide (thiocyanate) tech., bbls.	lb.	.17
Antimony Chloride (butter of antimony), sol., cbys..	lb.	.17
Arsenic, White, powd., keg, l.c.l.	lb.	.0475
Barium Carbonate, pptd., bags, l.c.l., wks.	lb.	.03
Benzene (Benzol), 90%, dms., wks.	gal.	.20
Borax, tech., bgs.	ton	$61.00
Butyl Lactate, dms.	lb.	.205
Cadmium Oxide, l.c.l., bbls.	lb.	.95
Calcium Carbonate (Pptd. chalk), c.l., wks.	lb.	.02
Calcium Chloride, flake, paper bgs, 5-ton lots	ton	$28.50-$41.00
Carbon Tetrachloride, l.c.l., 52½ gal. dms.	gal.	.80
Cobalt Sulphate, dms.	lb.	.65
Copper, Acetate (verdigris), bbls.	lb.	.26-.50
Carbonate, 52-54%, bbls.	lb.	.195-.205
Cyanide, tech., 100 lb. bbls.	lb.	.34-.38
Sulfate, 99%, crystals, bbls., 1-5	lb.	.0565
Cream of Tartar (potassium bitartrate), kegs	lb.	.585
Crocus Martis (iron oxide), bbls., c.l.	lb.	.09
Dextrin, white, bags, l.c.l., F.O.B. Chicago	lb.	.0415
Diethylene Glycol, dms., l.c.l., wks.	lb.	.155
Emery (Turkish)	lb.	.08
Ethyl Acetate, 85-90%, l.c.l., dms.	lb.	.122-.125
Ethylene Glycol, l.c.l., dms.	lb.	.165
Monobutyl ether, dms., l.c.l., wks.	lb.	.175-.205
Gold, Chloride, yellow, 4 oz. bottles	oz.	$19.00
Cyanide, potassium 41%, bottles, wks.	oz.	$14.20-$14.95
Cyanide, sodium (46%)	oz.	$17.10
Gum, Arabic, white, bgs.	lb.	.33-.35
Hydrogen Peroxide, 100 vol., cbys.	lb.	.16-.185
Iron Chloride (ferrous), cryst., l.c.l., f.o.b., Midland, Mich.	lb.	.035
Iron Chloride (ferric), cryst., bbls.	lb.	.05-.08
Iron Sulfate (Copperas), cryst., bbls., 1-4 wks.	lb.	.02
Lead, Acetate (Sugar of Lead), cryst., bbls.	lb.	.125
Oxide (Litharge), com., powdered, bbls.	lb.	.09
Lead, White, dry bbls.	lb.	.085
Magnesium Sulfate (Epsom Salts), tech., bbls.	lb.	.019
Mercury Bichloride (Corrosive Sublimate), cryst.	lb.	$2.39
Mercuric Oxide, tech., red, powder, bbls.	lb.	$3.26
Mineral Spirits, tanks	gal.	.10
Naphtha, V. M. & P., tanks	gal.	.11
Nickel, Carbonate, dry, bbls.	lb.	.36-.365
Chloride, bbls.	lb.	.18-.20
Salts, single, 425 lb. bbls.	lb.	.13-.135
Salts, double, 425 lb. bbls.	lb.	.135-.145
Paraffin, refined, 123-125 A.M.P.	lb.	.052
Perchlorethylene, dms., l.c.l.	lb.	.0832-.085
Potash, Caustic, 88-92%, flake, wks., c.l.	lb.	.07
Potassium, Bichromate, casks	lb.	.10
Carbonate (potash) calc., wks., dms.	lb.	.065
Cyanide, 94-96%, dom. dms., wks.	lb.	.55
Nitrate, rfd., gran., bbls.	lb.	.0835-.086
Permanganate, tech., dms., wks.	lb.	.1975-.2025
Phosphate, dibasic, ¼ lb. bottles	lb.	.91
Pumice, ground, 1½ F. & coarser, bbls., wks.	lb.	.045
Quicksilver (Mercury), f.o.b. West Coast, 76 lb. flasks, net	flask	$191.00
Rochelle Salts, crystals, bbls.	lb.	.44-.47
Rosin, gum, D dms., dock	lb.	.0366
Silver, Chloride, dry, 50 oz. lots	oz.	.455
Cyanide, 100 oz. lots	oz.	.41⅛
Nitrate, 100 oz. lots	oz.	.32⅝
Sodium, acetate, flake, gran., powd., 60%, bbls. l.c.l.	lb.	.055-.06
Bisulphite, powd., bbls., l.c.l., wks.	lb.	.0350-.0360
Bicarbonate, tech., bbls., l.c.l.	lb.	.0205
Bichromate, l.c.l., wks.	lb.	.0750-.0775
Carb. (soda ash), light, 58%, bags, l.c.l.	lb.	.0213
Citrate, U.S.P., dms.	lb.	.24-.29
Cyanide, 96%, dom. 100 lb. dms.	lb.	.15
Hydroxide (caustic soda) 76%, flake, l.c.l.	lb.	0.355-.049
Metasilicate, granular, 1-9 bbls.	lb.	.0355
Nitrate, rfd., gran., bbls., wks.	lb.	.0375-.04
Nitrite, 96-98%, dom., bbls., l.c.l.	lb.	.089-.119
Orthosilicate, anhyd., 1-2 dms., l.c.l.	lb.	$5.45 -$5.85
Phosphate, dibasic, cryst., bags, l.c.l., wks.	lb.	.0295-.0345
Phosphate, tribasic, kegs, l.c.l., wks.	lb.	.0415
Pyrophosphate, anhyd., bags, c.l., wks.	lb.	.0528-.0610
Sesquisilicate, dms., l.c.l.	lb.	.0405-.043
Stannate, dms.	lb.	.325-.365
Sulfate, anhyd., bbls., wks.	lb.	.022-.024
Sulfide, cryst., bbls., l.c.l.	lb.	.029-.0315
Sulfocyanide, C.P., dms.	lb.	.55-.65
Thiosulfate, cryst., bgs., wks., l.c.l.	lb.	.025
Sulfur, Flowers, U.S.P., l.c.l.	lb.	.034-.0355
Toluene (Toluol), 2°, ind., dms.	gal.	.33
Trichlorethylene, dms., l.c.l.	lb.	.085
Tripoli, air-floated, bgs., c.l., wks.	ton	$21.50
Wax, Bees, yellow, crude	lb.	.4475
Carnauba, refined, bags	lb.	.7775-.90
Spermaceti, blocks	lb.	.26-.27
Whiting, chalk, l.c.l.	ton	$20-$24
Xylene (Xylol), ind., returnable dms., wks.	gal.	.32
Zinc, carbonate, tech., bbls.	lb.	.14-.20
Cyanide, 100 lb. kegs	lb.	.33-.37
Chloride, tech., granular, dms., c.l., wks.	lb.	.0575
Dust, bbls., l.c.l., wks.	lb.	.1135
Oxide, lead-free, bags, l.c.l.	lb.	.0750
Sulphate, crystals, bbls., l.c.l.	lb.	.046

JUNE, 1943

ORGANIC FINISHING

SECTION OF METAL FINISHING



QUERING • ENAMELING • JAPANNING • PAINTING

WHEN YOU PUT TWO HEADS TOGETHER YOU GENERATE

Synergism

. . . and when you have *synergism,* you are well on your way toward solving your "unsolvable" problems.

WHAT IS SYNERGISM? It is a vital force within each of us, which, when released, transmutes mere competence into sheer genius; a force which enables human effort to produce superhuman results. Or, as one brilliant mind has put it, *synergism* is the spark which makes 2 + 2 = 5.

The scientist experimenting alone may just miss finding his magic formula. But discussion with a colleague may supply the missing link. That's *synergism!*

So, too, can we join forces with you to find and perfect new products from joint research and development. We have seen synergism at work and respect its power. In finishing, for instance, it is not just selection of a coating that we strive for, but to find from *you* all the requirements of the job, create the finish and work out the entire finishing procedure.

So it was on Zapon Duranite steel shell case finish. A coating to preserve this equipment right into the cannon's breech was designed starting from the basic materials of the finish right through to the exact specifications of application. Working with ordnance officers and manufacturers, we put synergism to work and it solved an important military problem, which may also have far reaching effects in peace time.

Let's talk things over, synergistically.

ZAPON

REG. U. S. PAT. OFF.

ZAPON DIVISION · ATLAS POWDER COMPANY

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INDUSTRIAL FINISHES

Section of
METAL FINISHING
Founded January, 1903
as Metal Industry
Publication Office
11 West 42nd St., New York

ORGANIC FINISHING

SECTION OF METAL FINISHING

JUNE, 1943

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War Time Finishing Problems

The present war has wrought great changes in the finishing industry. Previous to the war most industrial finishing materials were "tailor-made" to meet a wide variety of requirements both as to application characteristics and final film properties. As a consequence, the number of different formulations was large and the quantities of many of them quite small. Today a different situation exists. A large part of our finishing material production is for direct war use where variety necessarily must be kept to a minimum and where quantities of individual items are large.

At first glance it might seem that this change would simplify rather than complicate. In some respects it has made for simplification. On the other hand, it has also created some new problems. For example, many ingredients employed in peace time finishing materials cannot be used for war finishes. The ingredients which can be used and are necessary for war finishes are in large demand and, because they are, shortages sometimes develop. This may produce finishing materials made of substitute ingredients which do not lend themselves to easy, trouble-free application. Again, some finishing departments, whose equipment was designed to handle a special type of finishing material, cannot use certain specification materials. In such cases some change in formulation is necessary if speedy and economical production is to be obtained.

We cite these problems because, although they are of great importance to those of us who are mainly interested in application of finishing materials, they are also the concern of two other groups, namely, the manufacturers of organic finishing materials and the various Army, Navy, etc., units responsible for the quality and quantity of war finish production.

It is possible that some of us do not know what these two groups are doing and what they have accomplished in the war time finishing program. We are, therefore, presenting in this issue of the Organic Finishing Section an article by a member of the manufacturers' group and one by a member of the Paint and Varnish Unit of the War Department. Both articles discuss war time finishing problems but from different points of view. We know that these two articles will be as interesting and informative to all who read them as they were to us when they came to our desk.

L. H. LANGDON, *Publisher* • T. A. TRUMBOUR, *Business Manager*

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—it's a new and revolutionary **METAL FINISH**

Here is a priority-free finish that is highly resistant to rust, corrosion, heat, impact, abrasion, scratch, acids and alkalis. It is applied by spraying, then cured through a heat cycle of from 250° to 700° F. It is non-volatile and non-explosive. It is unaffected by heat of over 1000° F. and possesses amazing resistance to thermal shock. The standard 200-hour salt spray tests don't touch it, and it is undismayed by accelerated weathering tests equal to 5 years normal weather.

Send today for complete information about this new and revolutionary development in the field of protective coatings. There are accredited ARMOR-VIT applicators convenient to your plant. These are experienced firms who can accept your product, ARMOR-VIT it, then return it to you on a jobbing basis. ARMOR-VIT, being priority-free, may make it possible for you to substitute iron or steel for the even more critical materials, such as chromium, zinc, brass, copper, cadmium, tin, etc. ARMOR-VIT is available in black, gray, or olive drab.

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Cicero · Illinois

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Butyl Alcohol Prices Revised Ceiling prices for fermentation butyl alcohol, an essential in the manufacture of solvents and lacquers, were revised on May 7, 1943 by Amendment 4 to Maximum Price Regulation No. 37. This amendment does not revise the $0.1425 base ceiling for butyl alcohol produced in Indiana and Illinois for delivery in the eastern territory. But, effective May 7, 1943, producers located elsewhere in the United States may charge $0.166 per pound in tank car lots until June 30, 1943, and after that date they may charge $0.19 per pound. The price for shipments of carload lots in drums for Indiana and Illinois producers is $0.1525 per pound; for other producers, it is $0.176 per pound until June 30, 1943 and $0.20 per pound thereafter.

Method of Pricing Black Plate Articles The Office of Price Administration has provided producers of articles made of black plate with a method of establishing maximum prices without applying to Washington for authorization. In Order 414 under Section 1499.3(b) of the General Maximum Price Regulation issued on April 24, 1943, this example of the new method is given: "1. A producer of gallon cans formerly used ten base boxes of 100-pound tin-plate to produce 1000 cans. He paid $5.00 per base box, less 2% for cash, plus $0.50 freight, for a net delivered cost of $54.00 per 1000 cans. Black plate costs him $4.20 per hundred pounds, less ½% for cash, plus $0.50 freight, and plus $1.00 for lacquering, or a total of $56.80. His ceiling price for the hot-dip cans was $70; the ceiling price for the black-plate cans under this order becomes $72.80. 2. A producer of friction-top cans formerly used two base boxes of 95 pound hot-dip tin plate in making 1000 cans. His net delivered cost per 1000 cans was $10.60. The necessary black plate now costs $7.66, or $2.94 less. His ceiling price for hot-dip cans was $20 per 1000; the ceiling price for the black plate cans is $17.06."

Mica Substitutes In spite of the fact that substitutes have been found for mica, which is used in the paint industry, the WPB Mica-Graphite Division reports that the shortage has not diminished because these substitutes are said to be still in the laboratory stage. The spokesman for the WPB Mica-Graphite Division said: "While these substitutes may eventually replace mica to the extent of 10 to 15 per cent of total mica requirements, remaining requirements will still absorb all expected production of mica in the higher qualities."

New Color Pigment Price Regulation About 45 manufacturers will be directly affected by Color Pigments Maximum Price Regulation 180, issued on May 7, 1943, and effective May 14, 1943. For example, the maximum prices per pound in Zone (a) in barrels, delivered, for blues and violets range from $.36 to $4.70; greens range from $0.23 to $5.00; yellows and oranges range from $0.16 to $1.35, and reds and maroons range from $.35 to $4.15.

Who Cannot Use The MRO Symbol According to Interpretation No. 2 to CMP Regulation 5, issued on April 22, 1943, all those who operate under the terms of CMP Regulation No. 5 are not permitted to use the MRO symbol for purpose of alloting controlled materials to others.

Return Containers Promptly The WPB Chemicals and Containers Division is urging everyone to return promptly to suppliers all containers to insure continued delivery of chemicals and allied products. It made these suggestions to users for returning drums. "1. Have your supplier pick up your empty drums when delivering full drums, or return empty drums to the works or warehouse from which received. 2. Deposit charge will be refunded upon receipt of drums in good condition. 3. Do not use pressure to empty drum. 4. Drums should be kept clean, but do not rinse. 5. Do not use for storage or shipment of any other material. 6. In returning drums, replace and securely tighten both bungs. 7. In returning open-head drums, do not interchange lids or lever locks. Be sure to return lock with drum. 8. Use proper size valves in order to prevent stripping of threads. 9. Do not tighten bung plugs excessively as this may rupture flange threads or loosen the spud which would ruin the drum. 10. Use faucet or spigot provided with straight threads equipped with resilient gaskets. Faucets equipped with tapered threads may turn the spud in the drum, thereby causing leaks, with the possibility of ruining the drum. 11. If possible, store drums under cover to prevent rusting."

Patent Rights Available For Small Fees Members of the metal finishing industry should secure patent lists from either the Washington or Chicago offices of the Office of Alien Property Custodian if they are interested in making available to themselves the patents which have been taken over by the government. Depending on the classification of patent list desired, the prices range from ten to twenty cents each. Library copies of the vested patents may be seen in the Custodian's offices located at 120 Broadway, New York, N. Y., and in the Field Building, Chicago, Ill. Of the more than 50,000 patents and patent applications taken over by the Custodian, 1,282 are in the field of ordnance and aeronautics; 25,423 relate to manufacturing, transportation, and power machinery; 6,647 relate to chemicals; 836 relate to metallurgy; and 6,889 relate to the electrical industry. The Alien Property Custodian is making these patents available to any reputable American firm or individual on payment of a license application fee of $50 for each single patent, plus $5 for each additional related patent. Licenses granted will extend for the life of the patent. The small fees make the most valuable patents available to the smallest American firm.

Protective Coating Dictionary Proposed At the April 29, 1943 meeting of the Paint, Varnish and Lacquer Industry Advisory Committee, the members were told that further restrictions in the use of linseed oil for civilian paints will be necessary to balance the future demand with the supply. After a considerable amount of discussion, the committee approved the proposed specific end-use dictionary list of protective coatings. The committee wants this list distributed to the trade as a reference work for producers, suppliers and consumers for simplification of allocation purposes.

WPB Office of Program Reorganized Under a new arrangement, the Office of Program of the WPB was divided into four bureaus in addition to the Vice Chairman's office. The Controlled Materials Plan Division is now in the newly created Production Control Bureau. The Distribution Bureau is made up of the Compliance, Controller and Canadian Divisions. The Stockpiling and Transportation Division is now under the Program Bureau. The fourth division is known as the Orders and Regulations Bureau.

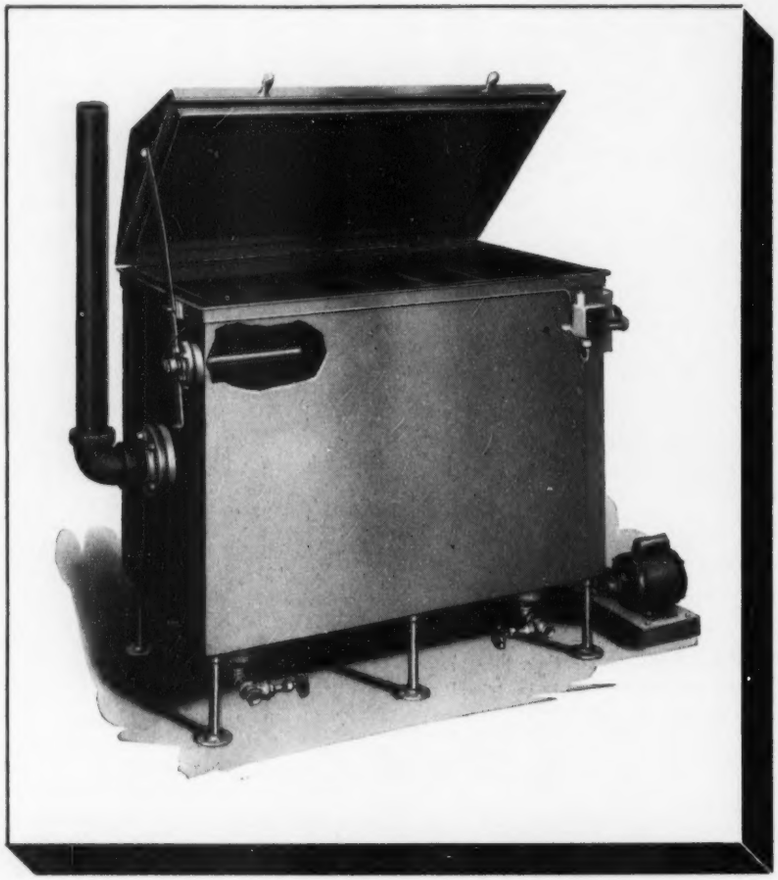
Salt Spray CORROSION TEST EQUIPMENT

Used by:

Electroplating Plants, Buyers of coated or plated metal & metal parts, Paint or Lacquer Laboratories.

Tests at controlled temperatures to conform with Army-Navy, Aeronautical specifications on Electroplated parts, as outlined in Bulletin AN-QQ-S-91-5 dated Dec., 1938 can very accurately be conducted.

These units can also be supplied without the temperature control, if this device is not required.



Designed to:

determine the corrosion resisting qualities of Electroplated or coated metal, Alloys, Metal Parts, Lacquered or Painted samples, etc.

The U. S. Bureau of Standards recommends the Salt Spray Test for this type of examination.

Special Features

This equipment combines all the necessary features, so that salt spray tests can be conducted to specifications at controlled temperatures from 65 to 140 Deg. Fah.

Temperature is accurately controlled by close adjustment of the temperature control switch, which controls immersion heaters within the Salt Water Compartment of cabinet.

The heated salt water when atomized creates the desired temperature within the testing chamber.

TESTING CABINET COMPLETELY COVERED ON INSIDE WITH 1/8" THICK RUBBER

Spray tips are made of glass, and can be adjusted to density of spray required. Air compressor is driven with ¾ H.P. motor, suitable for constant duty.

Standard Sizes

No. 1	**48" long**	**26" wide**	**36" deep**
No. 2	**36" long**	**24" wide**	**30" deep**
No. 3	**30" long**	**18" wide**	**30" deep**
No. 4	**24" long**	**15" wide**	**30" deep**

Note:—On all sizes the SALT WATER COMPARTMENT with ATOMIZER and SPRAY BAFFLE assembly consumes an area 10" long & 18" high across the width at one end of the bottom inside of cabinet. (Ample space remains for racking longer pieces the full length of the upper part, and for smaller articles in the lower part of the testing chamber.)

Sturdy rubber covered angle bars are supplied with each unit on which to rack pieces to be tested. Special racking arrangement can also be supplied when specified.

(These units can be supplied without Compressors where a source of compressed air is available.)

SALT SPRAY TEST is the standard by which rust resistance is measured.

The quality of plating can be certified and serious losses avoided by checking production with systematic tests. Products tested in this manner enjoy a definite advantage in selling, as the salt spray test now widely used means protection and satisfaction to buyers of plated or coated metals and metal parts.

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Modern Finish Testing Laboratories

By
GERALD ELDRIDGE STEDMAN
Chattanooga, Tenn.

SERVEL, Inc., of Evansville, Indiana, maintains an engineering department which is well known. Servel president Louis Ruthenburg, an able engineer himself, has insisted that this department be staffed and equipped second to none. Dr. W. R. Hainsworth, vice-president in charge of engineering at Servel, ranks high in the chemical engineering field. The engineering department is subdivided into three divisions: Operations, Development, and Research. In these three divisions there are 186 engineers housed in a 131 ft. x 307 ft. engineering building, divided into 11 sections: administrative offices and technical library, drafting and clerical rooms, chemical laboratory, household refrigeration unit testing laboratory, all-year air conditioning testing laboratory, packaging laboratory, organic finishes laboratory, physical testing laboratory, machine shop, and pattern shop. Among employees are chemists, metallurgists, paint engineers, draftsmen, photographers, librarians, industrial x-ray technicians, wood workers, machinists, welders, and sheet metal workers. The staff originates from 19 states and five foreign countries. It has received training in 36 universities. It holds 45 college degrees, eight of which are Doctor of Philosophy and 15 of which are Chemical. Of 649 patents held by Servel, 133 are held by 16 present engineering employees.

A general view of the Servel organic finishes laboratory.

Widely recognized for its many developments in the refrigeration and air conditioning industries, the engineering department has effectively converted its talents into war engineering and has concerned itself with such products as Kurz-Kasch antennae, field range fire units, Hercules cargo bodies, Republic P 47 wing sections, Jacobs and Pratt & Whitney engine heads, the 37 mm. brass (and now steel) cartridge case, and the A.O.G. gun breech—all of which have received intensive engineering attention.

It is to be expected that the Servel organic finishes laboratories should be preeminent in that the company, because of its important position in the household refrigeration field, makes wide use of organic finishes. This division is under the able direction of A. J. Sharer, organic finishes engineer. Exhaustive experiments and tests are being conducted continuously by this division on the many types of organic finishes for use in both civilian and war production.

At the present time much substitution work is being done in organic finishes. Plated and painted steel have been developed to substitute for previously used aluminum, stainless steel, brass, zinc, and copper. Intense research has developed new application methods and protective coatings fitted to varied new requirements such as aircraft wings. The change from brass to steel cartridge cases has necessitated development of corrosion resisting varnish coatings. Experiments have

The Pfund Cryptometer in action. The special hood arrangement provides a constant light source so that successive readings are always comparable. Note the white enamel on the black base of the instrument. All finishing materials are checked in this manner to determine the square foot coverage per gallon.

been undertaken to secure the best in phenolic baking varnishes. Much of the information on this activity is restricted, but it is available to accredited manufacturers who may inquire from the Servel engineering department. This department is becoming a focus for reference because of the breadth of its research.

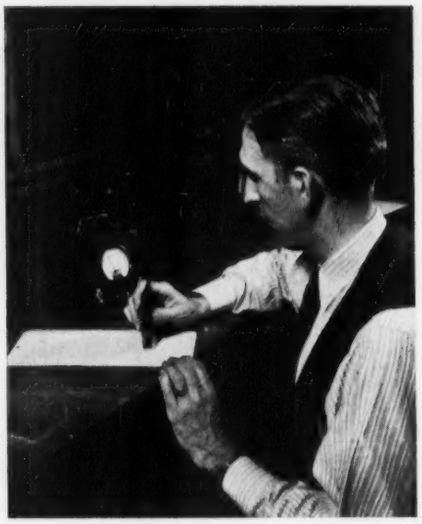
It was interesting to visit the Servel engineering department recently and spend some time with Mr. Sharer in his organic finishes laboratories. I was pleased to note that, with all the war work in research, the problems of organic finishes in civilian production were not being neglected or arrested. The division has made some notable advancements in the application of refrigerator finishes which will result in definitely higher standards in appearance, durability and quality of product at the war's end. It would seem pertinent, therefore, that I brief my impressions of this Servel visit, particularly to describe organic finish tests being employed, many of them Servel-originated.

We are considering here the application of organic finishes to cold rolled furniture steel, SAE 1010, which has been given a zinc-iron-phosphate coating as a pre-primer metal preparation. This is the type steel used in Servel cabinet construction. Once organic finishes very commonly were tested by submerging panels in boiling water for a few minutes. If they passed this water test, the finish was declared satisfactory. The Servel paint division, however, does not satisfy itself until 12 thorough tests have been satisfactorily concluded.

The Servel water test indicates the degree of engineering caution employed. The test panels are submitted to flowing distilled water at 110° F. This water is constantly aereated. Panels are exposed therein under test for 2,000 hours, not just a few minutes.

Duplicate panels are also tested in the humidity cabinet of Servel design.

Salt spray cabinet. Panel being examined for breakdown.



The magnetic film thickness gauge in operation. These gauges are used not only for laboratory control but throughout the plant where Servel organic finishes are applied. Film thicknesses on Servel refrigerator finishes are controlled to a maximum of 0.0025 and these gauges serve to establish and maintain the uniformity of coating desired.

This test provides a 100 per cent relative humidity at 110°F. for 2,000 hours and longer. Finish endurance records of 2650 hours with no breakdown of coating have been recorded.

Flexibility and adherence of coatings are judged by a bend test in which panels are placed on a $\frac{1}{4}$" mandrel and given a 180° bend. An impact test is given for the same purpose. This is sometimes referred to as the guillotine test and consists of a 2½ lb. weight driving a ball-tipped hammer. The ball diameter is $\frac{9}{16}$". This falls 24" into a metal cup seated in an anvil. This impact test measures the distortion of the finish film which is possible without fracture of the coating.

Servel has originated an effective test to measure coating resistance to cooking greases. This is an accelerated test made possible by concentration of fumes. The fume mixture is of cooking oil and butter. A special fume cabinet has been designed which uses a control burner in which the flame impinges upon a pan, driving the fumes up into the cabinet through a series of baffles. The fumes in that manner contact the painted surfaces of the test panels. One half of such panel surface is masked or mittened with a sealed metal shield. The fumes flush continuously against the exposed section of the panel for 150 hours. After the panel is removed from the

This laboratory technician is examining the result of a wear test on the grease abrasion machine. This equipment, which was designed by Servel, is used for determining the wear resistance of refrigerator paints, lacquers, enamels and vitreous coatings.

cabinet, the mask is taken off and there can be no distinguishable line of demarcation between exposed and mittened sections or the test is unsatisfactory. This is one of the most exacting of organic finish tests.

Servel has also originated an effective abrasion test. The equipment consists of a Servel-designed tester having metal feet with felt pads. These pads are saturated with rancid butter, high in butyric acid content, which attacks the finish. The panels are fastened in the tester. The pads are scrubbed back and forth against the test panels and the finish must withstand 150,000 such double strokes without evidence of abrasion or any appearance of wearing. The second phase of this test is made by adding a 5 lb. weight and continuing the test another 150,000 double strokes. The coating must withstand this test as well. These pads may be soaked in all manner of other agents likely to attack the finish, such as stale beer, lemon juice, etc.

Servel maintains a roof exposure cabinet in which test panels are exposed to the conditions of climate and weather of back-porch use, a common situation in the south. Covered with special glass that does not filter out much sunlight, the panels are submitted to a combination of 45° south sunlight plus steam introduced into the cabinet to promote moisture. The test runs for 21 days of normal summer exposure. Again, one-half of the test panel area is masked and sealed. The purpose of this test is to accurately check fading and chalking of the coating.

Another test is the accelerated aging test. This is accomplished in a dry heat cabinet with a constant 140° F. carefully dehydrated atmosphere. The total exposure of the panels in this test is 84 days. They are removed every 14 days and submitted to impact tests to determine the life of the film and to check for brittleness and loss of adhesion.

Still another Servel test is that employed for color retention. Panels are exposed in a 45° direct south sunlight and their values are checked in a unique color comparator against their own half-masked portions and also against a complexity of rotated panel combinations.

White is, of course, the absence of color and is the most difficult problem in the organic finish field. Interchangeability of cabinet panels has made color control essential. Servel has achieved unusually close control by its system of close liaison with the paint supplier, whereby wet samples of standard materials are maintained to assure perfect matching results.

The control method is to provide a half-pint wet sample of the current batch of material to the paint supplier before the batch has been used. Before a new batch shipment, a pre-shipment sample in pint containers is provided to Servel laboratories and the shipment is not released until the supplier has received sample approval. Half of each pint container is used in the pre-testing by Servel, the other half continuing as the control standard.

The pre-shipment sample, after

Water soak tank. This test is correlated with the humidity cabinet and duplicate panels of the same finish are tested in each. The bubbling action of the water is produced by air jets buried in the tank. Operated at a temperature of 110° F. painted panels are subjected to this test for 2,000 hours with no evidence of failure.

thorough stirring, is given a test-panel date, a spray-out is made, the sample is compared against the retained colored standard, and it is baked and color-compared on a north daylight calibration.

The film thickness limit established by Servel is 0.0025". A two-coat system, primer plus enamel, is used. Servel has originated its own tradename, "Newtone," a synthetic enamel having all the improved characteristics which their organic finishes laboratories have developed. Laboratory spray and baking methods completely parallel shop production technique. The laboratory uses an electric oven for baking; the primer cycle being 60 minutes at 290°F., the enamel being baked 90 minutes at 275°F.

The spraying viscosity of the primer is maintained at 18 seconds on No. 4 Ford cup. The enamel viscosity is maintained at 20 seconds on No. 4 Ford cup. All viscosity readings are made at 78°F. All test panels are pretreated. A hiding power test of primer and enamel is made using a Pfund Cryptometer. A special hood provides controlled light for this test.

Those factors which are considered essential in the maintenance of established standards include hiding power, color retention, per cent reduction, total solids, hardness, curing of film, flexibility, adhesion, distensibility, resistance to moisture, cold checks, and general workability. A number of these tests are Servel-originated, with specially designed equipment. The Servel engineering department has built some of this Servel-designed test equipment to the order of outside interests. Several of its abrasion testers and fume cabinets have been adopted as standard laboratory equipment by paint suppliers and others.

Servel, Inc., is the leading Republic Aircraft sub-contractor, producing wing sections for the P 47. This naturally has led the organic finishes department into exhaustive experimentation and tests of coatings for such purposes. Zinc chromate primer has replaced the previously used specification material. Neutral gray and olive drab are used as the exterior finishes. Insignia coatings are made to specification in white, blue, and black. The wing interior receives primer coat only. Exteriors receive one primer and one lacquer coat. Olive drab lacquer is applied to the top wing surfaces, neutral gray to the bottom surfaces.

Ordnance Specification AXS 736 on corrosion preventatives in relation to steel cartridge cases is interesting in that it does not have an approved list of suppliers. The contractor must establish and maintain his own approved sources. This indicates the importance of having a manufacturer's laboratory, such as Servel's organic finishes division, assure meeting with specifications. Detail requirements as to color, resistance to toluene, acetic acid, ammonium hydroxide, ethyl alcohol, ethyl ether, adherence, corrosion resistance, abrasion resistance, and thermo-plasticity of such war finishes require unusual laboratory efficiency. The metal treatment employed by Servel at present on its cartridge casings produces a stable crystalline phosphate coating conforming to the requirement of Specification AXS-735.

Most of the war products will be subject to salt laden atmosphere. It is therefore essential that the coatings be capable of protection against salt air corrosion. Tests for resistance to these conditions are conducted in a salt spray cabinet wherein production samples are suspended on glass rods to insure against contamination. Operating temperature is 90°F. and the make-up solution is maintained at 1.151 specific gravity. A.C.P. sodium chloride and distilled water are combined to produce a solution strength of 20 per cent. Liquid once used is allowed to escape through a drain and none returns to be resprayed. The samples are so placed that the spray does not impinge directly on them. All pieces undergoing the test are rotated each 24 hours to assure equal conditions of test. Required periods vary from 24 to 250 hours.

The Servel finishes laboratory continues its explorations of organic finishes, covering many problems having to do with the appearance, durability and quality of its products. Field reports on certain of its products in the war indicate that the engineering work on organic finishes by Servel will be of inestimable value in post-war design.

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Photo U. S. Army Signal Corps

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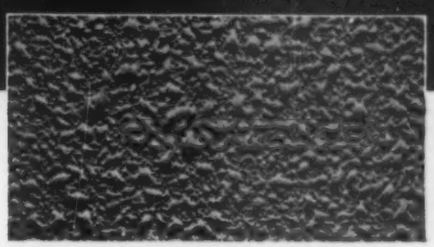

Here are shown actual photographs (unretouched) of panels finished with PEBBLE-TEX. Above shows coarse texture.

This panel shows a finer texture. The size of the pattern is regulated by spray gun adjustment and application technique.

Send today for trial order at drum price. Write to Dept. MF

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ROCKEFELLER CENTER, NEW YORK, N. Y.

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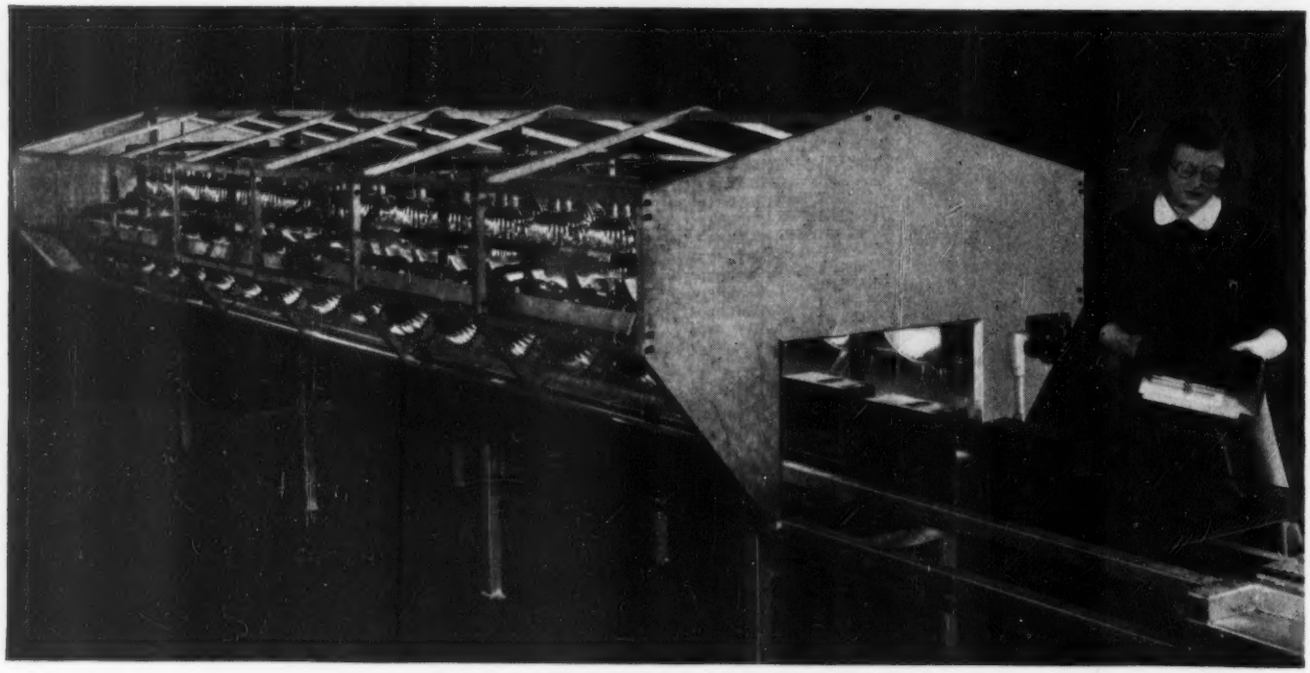

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HEADQUARTERS FOR INFRA-RED BAKING AND DRYING

3666

Organic Finishes in the War

By C. A. LANKAU

MUCH has been written about the role of organic finishes in the war effort. Many individual finishing processes and problems have been described in detail. Some of the intricacies and problems of the finishing industry, due to restrictions on the use of raw materials and to the nature of finish requirements, have been told. Yet the true importance of the part played by the finishing industry, as well as its relationship to its associated industries, is little understood.

Protection

Prior to the war, organic finishes —usually called paint by the uninitiated—were too often considered merely decorative mediums. While color and brilliance are features which may be used to enhance the beauty of an object and give it additional appeal, the primary purpose of organic finishes is protection against the elements, handling, various chemicals, and other factors which may cause deterioration. This property of protection becomes very important in time of war when most resistant materials are very scarce and many objects are being made from materials which are susceptible to rust, corrosion, etc.

By its allocation of critical raw materials for protective coatings, the War Production Board has recognized the importance of adequate protection of war products. Without such protection many war articles would become useless through rust and deterioration long before they reached the firing line. Some objects of war are manufactured in parts in various sections of the country and do not meet for assembly until they reach the battlefield. For example, certain chemical bomb bodies may be manufactured in the south, the tail fins in the mid-west, and the nose piece and firing mechanism in the eastern part of the country. These are shipped separately to the point of use. When a plane is to be loaded, a certain number of each part is brought up and assembled. Should any part be faulty or fit imperfectly due to rust or corrosion, it may not function properly. This may cause delay in loading the plane, imperfect firing or missing the target. Any one of these factors may mean the lives of one or many of our boys. Such catastrophies must be kept to an absolute minimum. As trivial as the coat of paint may seem, it is very important.

(This article is based on an address made by the author before the American Electroplaters' Society at the annual meeting recently held in Boston.)

Other War Finish Uses

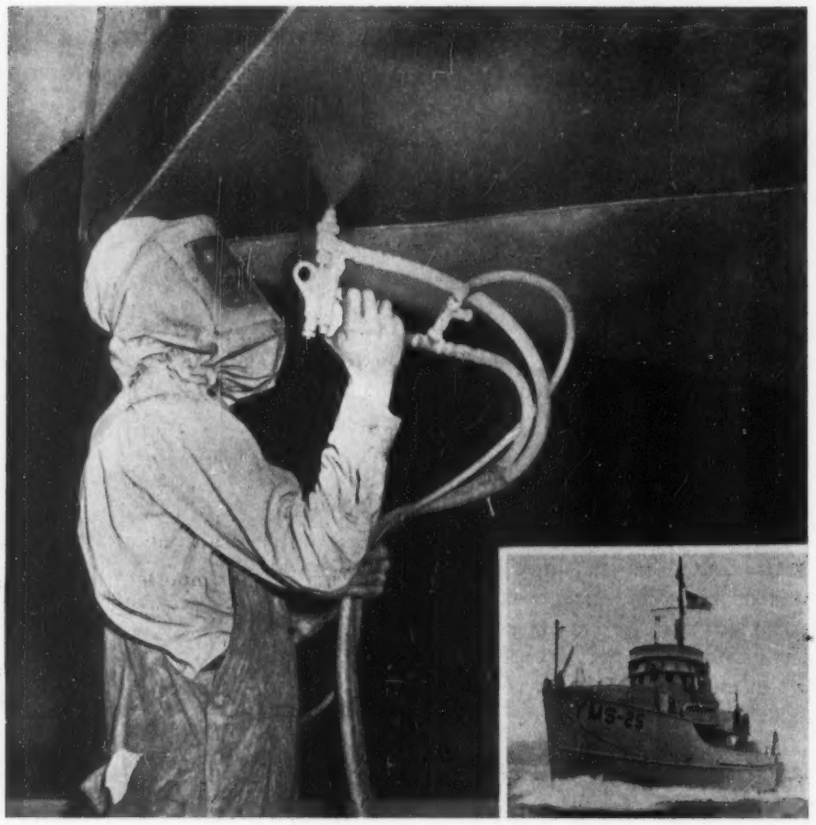
In addition to providing adequate protection to many articles and parts, organic finishes are releasing many pounds of metal for more important uses. Uniform buttons and insignia were formerly made almost exclusively of brass, silver and other critical metals. Today very little of these metals is used for such purposes. Steel, iron, fibre and plastics colored and protected with organic finishes are being substituted for them. An examination of the list of war materials will show a large number of similar examples where critical materials are being released through the use of organic finishes.

In military equipment, reflection of light has a great importance and consequently flat or lusterless finishes are required. This is true of a great many parts, whether exposed on the exterior or confined to the interior where light may be reflected through windows or openings. Therefore, the vast majority of war finishes is of the lusterless type. This has necessitated entirely new developments, new techniques and new thinking on the part of finishing engineers. Previous to the war, in order to add beauty to their protective qualities, most organic finishes were made semi-glossy, satin finish or glossy. Dead flat or lusterless finishes were known to have certain weaknesses. Among these were poorer adhesion, rubbing up glossy, poor moisture and salt spray resistance, poor flexibility and film strength and porous film. In war finishes it has been necessary to reduce these weaknesses to a minimum and many of them have been entirely eliminated. This was done with a greatly curtailed and restricted list of available raw materials.

Finally, the important field of camouflage finishes is worthy of note. In this field not only is lack of light reflection a consideration but color and type of pigments used are also very important. The color must match certain selected standards chosen by the armed forces for their difficulty in distinction from the surrounding terrain. These colors are not only poorly detected by the eyes but photograph with great similarity to the surroundings on ordinary panchromatic film, thus literally blotting them out. In some instances, not only the above requirements must be met, but also camouflage against infra-red film must be effected. This involves a special study of pigmentation. For example, while a color may be made to match foliage, the pigment of the paint may have different reflection of infra-red light than the pigment of the foliage. In such a case, ordinary photographs would not detect the camouflage but pictures taken with infra-red sensitive film would disclose the entire deception. This can be overcome by carefully selecting pigments for their infra-red reflectance, choosing special methods of manufacture and blending the pigments to give both the proper color and final composite infra-red reflection to fall within limits determined by the armed forces as most effective.

Specification Finishes

In general, war finishes are made with the most readily available materials and are specially formulated to give speed of application with the minimum number of coats and operations. In many cases the durability is not expected to be up to the high



(Illustration courtesy of Eclipse Air Brush Co. Released by the Navy Dept.)

standards set by industry in peace time. Many finishes will be short-lived. For example, no one cares what happens to the finish on certain types of ammunition when the charge is set off. The important point is that the ammunition be adequately protected until it is fired. On the other hand, some of the ammunition may be stored in the desert and be subjected to high temperatures and sand storms. The finish should have reasonable resistance to such conditions.

War finishes should have the fastest possible drying time commensurate with the desired requirements. The finishing schedule should be the most practical to permit high speed production with the minimum of manpower. This involves the proper choice of application, depending upon the article, as well as the least number of coats and operations such as sanding and handling. The object in war production is to produce as much as possible as quickly as possible. Hence, the finishing material used should be formulated with this fact in mind. The most practical finishing schedule may not always meet the specification, in which case a comparison of the results of both methods should be submitted to the branch of government service with which the contract is held, together with a request for a waiver of that part of the specification in question. If the results show equal or better quality or a saving of time or labor, the request will undoubtedly be granted.

Specification finishes may be divided into two classes, namely, formula specification finishes and performance specification finishes. As the name implies, the former requires the finish to be made according to a definite formula from which there may be no deviation except as specifically stated. Speed of drying, building power, gloss, baking temperature, etc., cannot be changed to meet the requirements of a particular finishing schedule. An example of formula specification is the Navy P-27-b-2. On the other hand, performance specification finishes may be made from any available materials as long as the final film meets the specified performance requirements. This type allows for substitution of ingredients as various materials become critical and is, consequently, more flexible and is being favored by the various government agencies. An example of this type of finish is covered by Army Ordnance Specification 3-162b.

In order to expedite manufacture, delivery, and use of a finishing material for war purposes, some kind of specification system is necessary. However, it should be borne in mind that it is not possible to have a specification for each use without the system becoming cumbersome and impracticable. In many instances a specification is chosen as being nearest to the requirements. The government agency purchasing the material cannot take into consideration the practical problems of the production line in the manufacturing plant. Often these problems make it difficult to use the specified material. In such cases the practical aspects should be given first consideration. Consultation with the finishing material supplier may prove advantageous in producing a material that will fit the production schedule and provide the necessary film characteristics. It is often found that the use of finishes which are more costly than the specification materials more than offsets their additional cost by saving time, money, and equipment in the finishing operations. The armed forces are interested in increasing production and maintaining the quality required by the specifications. As long as quality is maintained and any saving of time and money can be shown, it should not be too difficult to obtain a waiver of specification.

A concerted effort is being made to consolidate the various government agencies' requirements into new specifications in order that the large number of duplications may be reduced. This consolidation will not only simplify the specification system but will, by rewriting obsolete specifications, improve war finishes and solve many manufacturing problems.

Developments

Many war items call for black oxide coatings of various types applied on a steel base. These coatings are resistant to corrosion, are lusterless, etc. However, they may be marred by rough handling. In order to protect the coatings, an air-drying clear lacquer which will withstand a rather severe salt spray test has been developed and is being used to a large extent. Other war items such as aluminum and steel parts for battleship, airplane, submarine, etc., equipment require a lusterless, air-drying or baking finish with a high order of durability and salt spray resistance. Materials have been developed which meet the requirements and have withstood upwards of 3,000 hours of salt spray tests.

(*Continued on page* 405)

Refinishing Salvaged Crown Shells With Lacquers or Enamels

By A. H. WARTH, Sc.D.

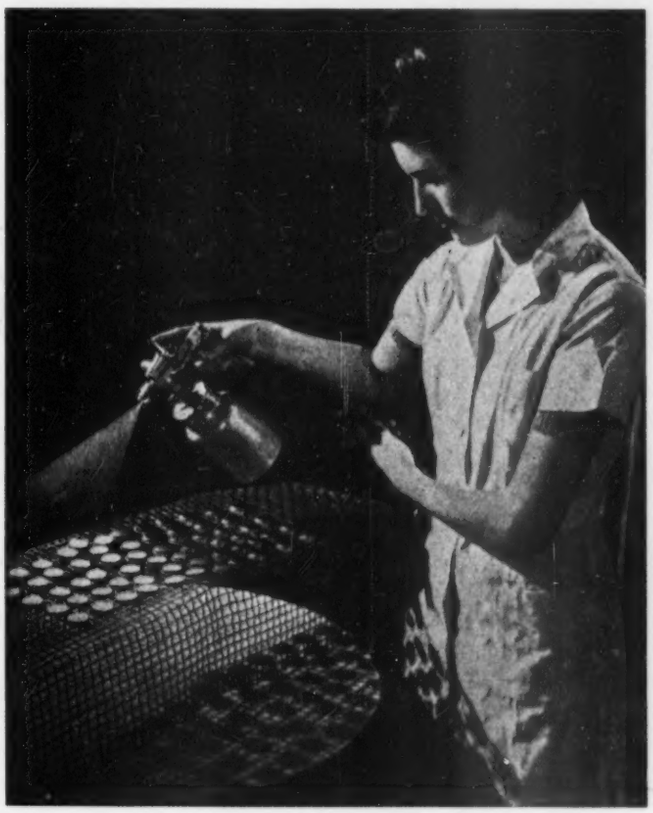
Crown Cork and Seal Co., Baltimore, Md.

SUBSTANTIAL amounts of used bottle caps have been finding their way to the cleaners, some professional, some semi-professional, and many inexperienced. Manufacturers of alkali cleansers have been a considerable help to the bottlers in cleaning the caps by providing rust inhibitive detergents. These cleansing agents not only remove the outworn lithographic decoration, but loosen the cork discs so that they can be readily separated by floating them free in water. The cleansed crown shells are thus made ready for the protective treatment that will not only improve their appearance, but which is to make them substantially rust-proof when they are redisked, and then eventually used in bottling beverages. The reforming or reshaping of the crown is either done before, or after the cleaning, usually before. However, many of the crowns returned by consumers are too damaged for reconditioning.

The process of reclaiming used bottle crowns involves four steps: (1) cleansing, (2) rinsing, (3) refinishing, (4) replacing inserts. The bottler is familiar in general with the washing and rinsing of bottles as it is part of his daily routine, and he soon becomes experienced in washing crowns. When using caustic soda in washing crowns, a solution of hot caustic of mild strength at a temperature of 180°F. is preferred. The caustic washing must be immediately followed with a thorough rinse in hot water to prevent the crowns from rusting. It is best not to place too much dependence on caustic soda as a reagent. It is better to follow the recommendations of reliable manufacturers of cleansers, as they offer detergents that include rust inhibitive agents. The caustic, or approved cleanser, will remove the old finish, whether varnish, enamel, lacquer, or lithographing, and will loosen the adhesive holding the inserts.

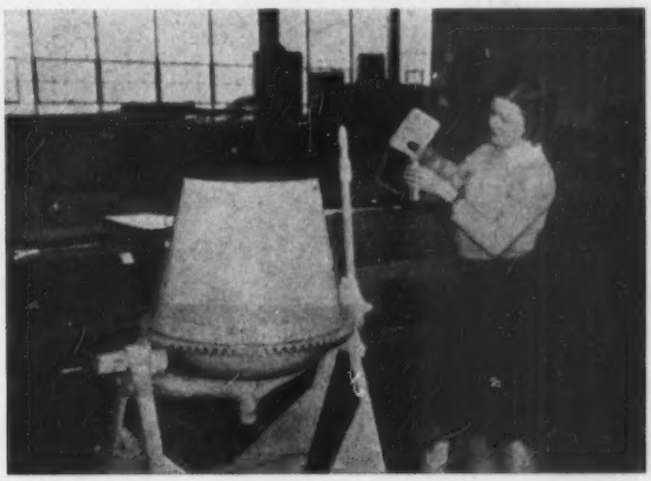
The corks are removed from the crowns by running cold water. The shells free from cork are then rinsed in hot water (at a temperature of at least 180°F.) to remove traces of caustic. When the shells are removed from the water they will dry quickly if thoroughly drained.

Refinishing operations may be broadly classified as (1) chemical treatments in which the surface skin of the steel is converted to a black oxide and then sort of waterproofed with wax; (2) the lacquering or enamelling treatments which provide far better protective coatings than when the re-shaped crown shells are chemically treated, making the crowns entirely rust resistant. This paper will be confined entirely to the latter systems of treatment, of which there are now four distinct methods:



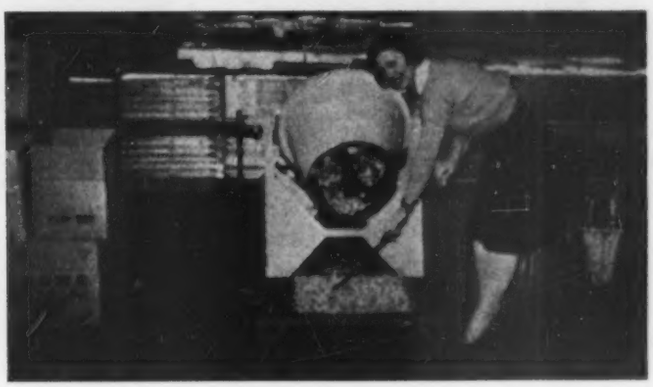
Courtesy of Roxalin Flexible Finishes, Inc.

Spraying method—spraying reshaped crowns with colored enamel.



Courtesy of R. E. Greenholtz

Tumbling method—preparing coating enamel for tumbler.

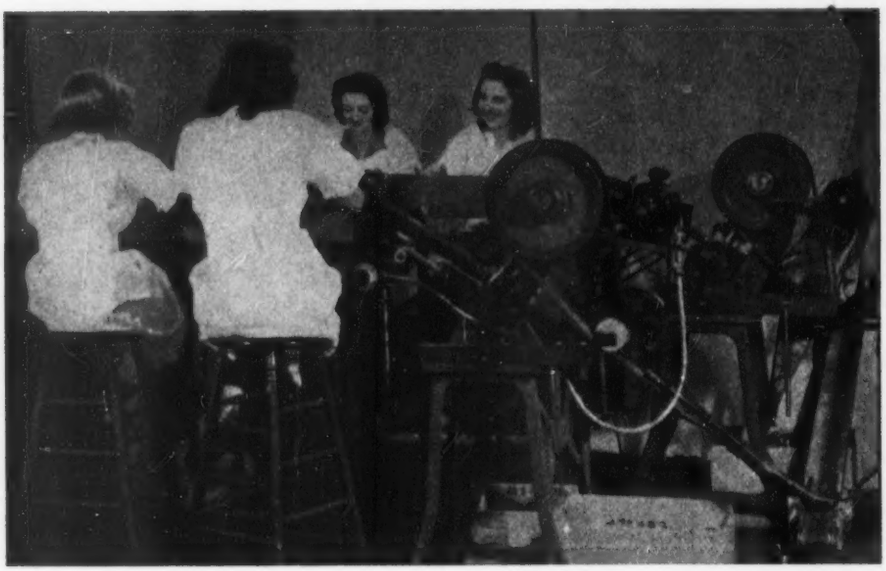


Courtesy of R. E. Greenholtz

Discharging enamelled shells from tumbler into wire trays for heat drying.

Courtesy of The Charles E. Hires Co.

Cleaning, rinsing and drying equipment.



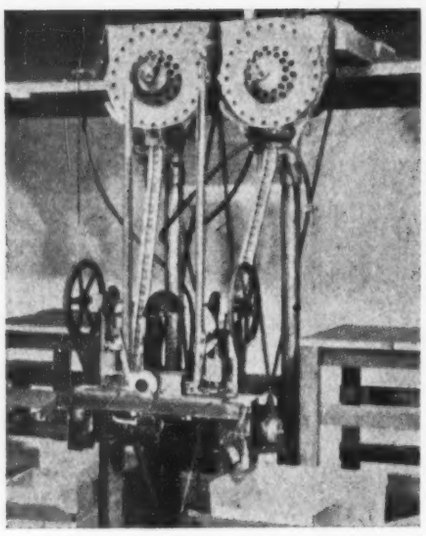
Courtesy of The Charles E. Hires Co.

Crown sorting and reshaping.

A. Spraying
B. Tumbling
C. Whirling
D. Conveyor Roller

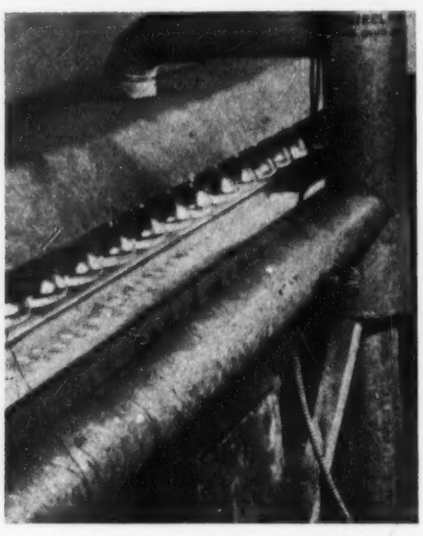
A. *Spraying.* The refinishing of reshaped crowns was applied at first in the reclaiming of used bottle crowns. The crowns were washed four ways; (1) cleansed in alkaline solution, (2) rinsed in hot water, (3) sterilized in a chlorine solution, and (4) given a final fresh water rinse. The crowns, thoroughly drained, could then be placed, disc upwards, on a line of endless belt passing through a drying tunnel, or under drying lamps, and automatically turned over on a ½" mesh screen conveyor when the tops and skirts were given a spray coat of good base lacquer of the desired color. This coat was then allowed a sufficient time for all of the lacquer solvent to evaporate from the film before dumping them into a box or storage bin. The discs in the crowns were given a spray coating of a clear, nitrocellulose lacquer.

The method of treatment as described above has been largely superseded by the spray method of coating the shells without cork inserts. The cleaned, reshaped crowns are arranged dome up on a coarse screen conveyor which travels past spray guns located above and below the screen conveyor. If the lacquer is of the baking or stoving type, the spray coated crowns are then passed through an oven which dries and toughens the lacquer, so that it will withstand hoppering, re-crowning, and pasteurization. Baking also hardens the lacquer sufficiently to enable securing a good, ad-



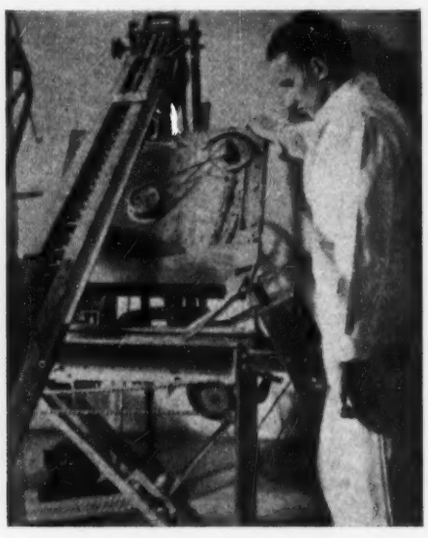
Courtesy of The Charles E. Hires Co.

Liner disc inserting equipment.



Courtesy of The Charles E. Hires Co.

Bank of drying lamps.



Courtesy of The Charles E. Hires Co.

Conveyor roller method—lacquering machine using brown lacquer.

hesive stick between the cork and the crown shell.

B. *The Tumbling Method* is well known to button manufacturers. The principle of operation is to place a quantity of small pieces in a tumbling barrel, and then add the minimum amount of coating material that will just coat the surface of the pieces. The tumbler is then closed, and after a matter of minutes, the pieces are ready to be removed. For example: with crown shells, 1 fluid ounce of enamel may cover a gross of crowns and is added in that proportion. The tumbling will take 5-20 minutes, when the crowns are poured out on a coarse screen tray. They can be spread out with a wooden paddle into a thin layer if the enamel is a slow drying one, before they are heat dried. Marks on a wet crown disappear when the heat hits the coating surface. A convenient size for the trays of one-half inch mesh screen is 30″ x 30″. If the enamel is fast drying they must be arranged in single layer, preferably dome up, and then dried under heat-drying lamps, (infrared lamps) or by any suitable oven.

C. *The Whirling Method* is one that is customarily applied to certain hardware objects. In applying it to crowns, the cleaned, re-shaped crown shells are placed in a wire basket which is arranged in a closed container. The bottom half of the container is filled with lacquer, so the wire basket can be immersed in it. The basket is geared to a revolving shaft so that it can be whirled both clockwise and counter-clockwise to throw off excess lacquer. The excess is caught by the sides of the container and drains back into the bottom tank. After the crowns are whirled for 30 seconds in each direction at high speed, they are poured out on a coarse screen, and arranged in a single layer, preferably dome up, and then baked to dry and harden the lacquer.

D. *Conveyor Roller.* The clean re-shaped crown shells are fed, dome up, on a coarse screen conveyor, which travels downward at about 45° angle and through a tank containing the lacquer. As the crowns approach the liquid level of the lacquer, they are held down by a large roller which revolves half immersed in the paint. This roller holds the crowns on the screen conveyor and prevents their floating off while being coated with lacquer in the tank. After being coated, the crowns are transferred from the screen conveyor to a screen belt that moves along under a bank of heat-drying lamps, the drying being aided by an electric fan, before they are emptied into the box.

Colors of the enamels or of lacquers used for refinishing crowns may be which ever are desired. The word lacquer as here used refers to a thinner material than an enamel. Green has better covering power than red. Gray is largely used. A brown color is used by a root beer manufacturer since brown is most often used in the lithographic decoration on a root beer cap.

The drying properties of enamels and lacquers may need to be modified by the manufacturer in accordance with the equipment facilities available for drying. Oven drying at a temperature of 250°F. for 20-30 minutes calls for slow drying enamels or lacquers. Very fast drying enamels cannot generally be used as there are too many difficulties with the cleanups, work stoppages, etc. Manufacturers furnish enamels of moderate drying properties that can be either used for baking or for lamp drying as desired.

It is impossible to recommend any particular process in preference to another, since a process in the hands of a skilled operator will often be a failure in the hands of a novice; or one process or the other cannot be operated because of lack of suitable equipment. Occasionally, ingenuity is displayed in using make-shift equipment, such as a small concrete mixer as a tumbling barrel, a crown feed dial or hopper removed from an old crowner to deliver the crowns for re-disking, etc. Re-disking, even when done by the crown manufacturers, is a very troublesome operation because of the many mutilates that result from crowns bent by openers, and the tendency of the crowns to nest in the shell in hoppers of cork feeding machines.

Manufacturers of enamels and lacquers who have been helpful in furnishing pertinent information concerning the use of their materials especially designed for the purposes above described are:

Ault & Wiborg Corporation, Cincinnati, Ohio.

Pratt & Lambert, Inc., Buffalo, N. Y.

Roxalin Flexible Finishes, Inc., Elizabeth, New Jersey.

(Reprinted from April, 1943 issue, The Crown.)

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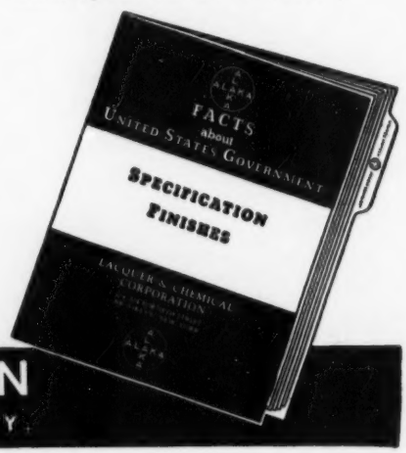

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New Coating Specifications

By MAJOR A. I. TOTTEN, JR.

Chief, Paint and Varnish Unit, Standards and Specifications Section
Resources and Production Division, Headquarters, Services of Supply, War Department

BEFORE starting on the subject of the War Department's paint, varnish and lacquer specifications, and the part industry can play in their development and revision, I would like to give you a general idea as to the position I fill in the War Department organization. As you all undoubtedly know, the War Department is composed of three groups: The Army Ground Forces, The Army Air Forces, and the Services of Supply. The last group, namely, The Services of Supply, is under the command of General Somervell and I am in his Resources and Production Staff Division. My responsibility in this division is to cover all phases of organic protective coatings involving conservation from the standpoint of seeing that General Somervell's policies are carried out. This necessitates reviewing all Army tentative specifications and giving final approval to all Army specifications to make sure that they are practical and not too restrictive. It involves, also, initiating action to revise specifications requiring raw materials that should be conserved for more essential purposes and to standardize specifications not only with the individual supply services such as Ordnance, Quartermaster Corps, Engineers, etc., but also with the Navy and all other government departments.

You can all understand that, at this time, with the raw materials required for protective coatings becoming more scarce, it is essential that the government and industry cooperate to the fullest extent to make sure that the particularly critical ones are used in those finishes that are the most essential and where the individual raw material's desirable characteristics are most required. For example, phenolic resins should be conserved for cartridge case coatings, boat bottom primers, plywood adhesives, and for such other end uses that absolutely necessitate the characteristics that these resins impart. They should not be used where less critical vehicles will serve the purpose. In this connection, I might point out that some paint concerns have requested the War Production Board to allocate phenolic resins for use in interior combat tank finishes. The reason for making such requests when cheaper vehicles could be used and the applicable specification met is not understandable unless it is to avoid the work necessary for the development of a new product. You might ask why allocation requests of this type sometimes are granted. This is due primarily to the time required to get any enormous project, such as the allocation one, functioning smoothly and efficiently. Such requests are now being carefully studied and the Resources and Production Division is working very closely with the War Production Board to correct this condition. However, this situation can only be completely eliminated by the paint industry taking every possible step to use the least critical materials necessary to meet the composition and performance requirements of a particular specification.

The problem of being as ready as possible for all eventualities in the raw material situation is one that must be faced immediately by both specification writers and by the paint industry. We in the War Department are attempting to do this as rapidly as possible and as an example I might cite Army Specification 3-175 for High Gloss Enamels. This particular specification, prepared by the Ordnance Department, covers two types of finishes, namely, a full alkyd and a semi-alkyd one. In the latter product, any resin can be used in conjunction with glyceryl phthalate except rosin. Army Specification 3-175 definitely stipulates that the full alkyd should be used only where extreme outdoor durability is required and that the semi-alkyd should be used for interior purposes and where limited outdoor exposure is involved. To carry out this policy semi-alkyd finishes are stipulated for carton and crate marking purposes and for use on the interior of combat tanks. With the 3-175 type of specification, a definite step has been taken to conserve phthalic anhydride and the very critical glycerine. Even more important, we are in a position to make a quick change to the semi-alkyd type for all purposes requiring a high gloss enamel as soon as circumstances necessitate it. I might add that lusterless and Army semi-gloss enamel and primer specifications will be issued in the near future on the same basis and that, furthermore, due to an excellent Industry-Ordnance cooperative program on this problem started over eighteen months ago, data are available showing the durability sacrifice which will be taken in changing from a full alkyd to a semi-alkyd and even to a straight gum type product on the lusterless type material. This is the kind of information we need and we can not expect to get all of it that is required from Army laboratories and certain few paint and varnish manufacturers.

With the vegetable oil situation becoming more acute, due in part to its increased use in food products, it appears that cold water and straight linseed oil-rosin paints will have to be used for a great many purposes. The Federal Specifications Committee has already prepared a new specification on a cold water paint which is now being circulated to the paint industry for comment. This is probably just a forerunner to what is coming and we must be prepared to have available the best finishes that can possibly be developed with the raw materials which are likely to be available in the future. What these will be no one knows definitely, but it is fairly safe to assume that linseed oil, Congo gum and rosin will last the longest. This development work is something that can not be done over night or even in a few months' time because outdoor exposure data are essential and no accelerated durability test has yet been developed which correlates outdoor and indoor results satisfactorily. This is a prob-

(Address delivered before the New York Paint and Varnish Production Club.)

lem which will require all the technical knowledge and facilities of the government and the paint industry.

Objectives

To aid in this mammoth program and to conserve to the greatest extent existing raw materials, manpower and equipment, we realize that it is essential that the War Department accomplish four things. These are:

1. Wherever possible, revise specifications that require an abnormal amount of time and labor to develop complying products.

2. Wherever possible, revise specifications that are so restrictive that consecutively satisfactory batches of material can not be produced.

3. Wherever possible, revise specifications that necessitate the use of very critical raw materials.

4. Give due consideration to the revision of specifications where complying products require an excessive period of time to manufacture.

These objectives of the War Department can only be accomplished by the paint industry providing constructive criticism of our protective coating specifications substantiated by well grounded facts and exhibits. Half baked or insincere criticism will only fog the issue and delay action. I can not emphasize too strongly the point that in forwarding suggestions to us you note the number of the specification or specifications involved with the exact paragraph or paragraphs in question. You can realize that generalities and indefinite statements are not conducive to prompt, if any, action.

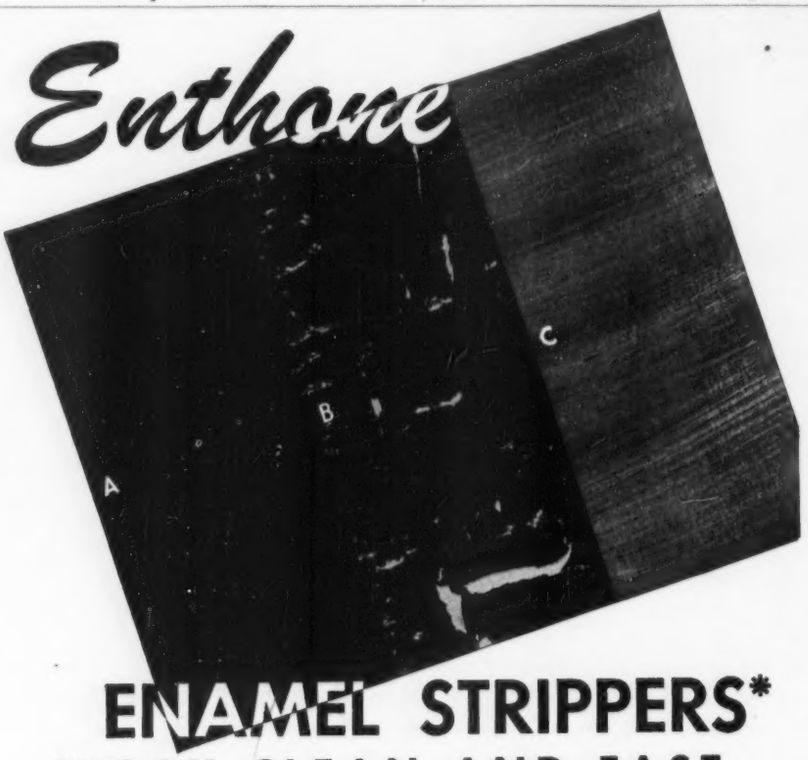
Accomplishments

Now I would like to describe briefly some of the projects that are under way in the War Department to aid in this entire conservation program. The first of these is the standardization of testing procedures. At the present time, the individual Army and Army tentative specifications include all of the methods necessary for testing products for conformance. In most instances test methods for a single property differ between specifications either in procedure or wording and consequently it is impossible for an operator to become proficient in conducting all of them in a reasonable period of time. In addition, the different methods of testing often require the use of different types of equipment which are not only expensive but in these times either impossible or extremely difficult to obtain.

The proposed procedure will standardize on the methods of testing any one property of the finish and will conserve laboratory testing equipment and it should result in the improvement of the technique of the individual operator. It will form a part of all Army tentative and Army finishing specifications and thus will eliminate the necessity of burdening specifications with testing information. This will conserve both time and labor in the formulation of specifications. A rough draft of this testing procedure has already been prepared and, I might add, it contains approximately seventy methods.

The second project under way is one covering the general simplification and consolidation of finishing specifications, taking every precaution possible to conserve critical materials. Already three consolidated specifications have been issued which have replaced a total of eight others. Action has been started also to review all Army protective coating specifications over five years old for the purpose of either revising them, approving their present form or cancelling them. To date, this has resulted in the cancellation of three, and 22 others are now in the process of being cancelled.

In addition, the Federal Specifications Executive Committee, of which



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The above panel shows how fast Enthone Enamel Strippers go to work.
Panel "A"—*Original enamel of urea-formaldehyde type*
Panel "B"—*After one minute in stripper*
Panel "C"—*After two minutes in stripper*

Notice that the enamel lifts away from the surface, leaving it clean and unattacked.

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Consult Enthone for stripping synthetics, japans, lacquers.

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(Illustration courtesy of Eclipse Air Brush Co. Passed by the Army for publication.)

I am a member, is rushing through as rapidly as possible a program on Federal paint specifications similar to the one above. I might add that wherever an Army and Federal specification covers a similar type of finish, every consideration is given to the possibility of cancelling the Army one.

A third major project being conducted in conjunction with the Navy and War Production Board covers the simplification of the color standards for protective coatings being used by all government agencies. At present 217 different standards exist but our preliminary review has indicated that these can probably be reduced to between 70 and 80. Of this number, approximately 50 per cent will be lusterless and the remainder high and semi-gloss.

A fourth project involves the processing and reuse of sludge material. This is a problem which warrants the serious attention of all of us since it constitutes conservation in the fullest meaning of the word. A gallon of satisfactorily processed sludge is a gallon more of enamel for essential war purposes. This project is one that requires the cooperation not only of the War Department and the paint industry but also of the contractors using paint products since water backed spray booths are necessary for sludge collection purposes. The contractors must take precautions also to see that one type of sludge is not contaminated with another type.

I believe the Holabird Ordnance Depot has done more than any other government department on this problem and it has already approved against its specification TAC-ES-680a olive drab, lusterless enamels and rust inhibiting primers containing appreciable quantities of processed sludge. However, in this sludge work it must be borne in mind that the final product submitted for approval, whether it be straight processed sludge or sludge blended with the virgin product, must meet all the requirements of the applicable specification. The paint industry must make sure also that it can make consecutive batches of a satisfactory product. It is realized that this is more difficult to accomplish with sludge than with 100 per cent new material but by working out the ratio of sludge to virgin material so that the same amount of sludge is incorporated in all production batches it should be possible. I think this ratio will be approximately four parts of new material to one part of processed sludge.

The last project I would like to mention is one involving a study of wood finishing systems. With steel becoming more and more critical, it is apparent that within a short time some equipment now made from steel will have to be constructed of wood. To be prepared for this eventuality, it is essential that we know what finishing systems will be satisfactory over different types of wood and just what sacrifice will have to be taken when it becomes necessary to change to less durable finishes than those now available. Industry and the Holabird Ordnance Depot are cooperating already on a program to cover some phases of this problem but more work is required. Your officers have agreed to help on this matter and they have aided in drafting a program which it is planned will be carried out as a cooperative one between the Paint and Varnish Production Clubs and the War Department.

I have attempted to cover very briefly the problems that we who are interested in paints have to face today. The entire picture is changing so rapidly due to the raw material situation that no one can estimate what our paint products will be made of a year or even six months hence. However, paint is a war essential and we must do our utmost to see that the best products are available using the raw materials with which we have to work.

Organic Finishing in the War

(Continued from page 398)

In like manner organic finishes are being used on a wide variety of war items for protection, camouflage, identification, etc. Fine instrument adjustment screws, battleships, guns, mines, bombs, radio dials, land vehicles—these are only a few of the items. An examination of the complete list of war machines and materials will indicate the uses of organic finishes in the war.

Not only are finishing materials themselves in the war; they have also assisted in the war by releasing many critical materials for more important uses. They have been adapted to high speed production and they have helped to reduce the number of operations required for finishing. While finishes formulated for war use may not be adaptable to peace-time requirements, we are now engaged in a war and organic finishes are in there firing.

Manufacturers' Literature

Asphalt Base Paints

Wishnick-Tumpeer, Inc., Dept. OF, 295 Madison Ave., N. Y., N. Y., have issued a series of specifications sheets on their various asphalt finishing materials, marine primers and enamels, asphalt solutions for use in equipment paints, etc. Included are descriptions of asphaltic base materials manufactured to meet U. S. Army Specification 3-106E for black acid proof ammunition paint and Federal Specification 52-P-17A for primer and enamel. The specification sheets list information such as composition, uses, recommendations for application, and similar useful data.

Centrifugal Blowers and Exhausters

Roots-Connersville Blower Corp., Dept. OF., Connersville, Ind., have issued Bulletin 120-B-12 covering their centrifugal blowers and exhausters. This is a 20-page booklet in two colors, profusely illustrated, applying to both single and multi-stage units in many sizes.

The foreword includes a brief history of the company's experience in building centrifugal units, together with a list of applications, and continues with a discussion of the advantages inherent in the centrifugal design. Pages four and five discuss the operating characteristics, with curves to substantiate the statements contained in the text.

Pages 6-11 inclusive are devoted to sectional views, types of impellers, and installation and shop cuts of the various single-stage units which comprise the company's line. Pages 12-17 picture the multi-stage line in equal detail.

One page is devoted to a discussion of various control devices which provide suitable regulation; another contains a number of action views of various manufacturing and testing operations.

Revised Specification Sheets

The Egyptian Lacquer Manufacturing Co., Dept. OF, Rockefeller Center, N. Y., N. Y., have issued a number of revision sheets for their booklet, U. S. Government Specification Finishes. The changes include a new index, five new specifications and nine revised specifications on finishing materials made by the manufacturer to conform with government specifications.

Paint Spray Booths

A bulletin describing the new line of Aqua-Restor paint spray booths and dust collection systems has been issued by the *Aqua-Restor Division* of the *Mayer Manufacturing Corp.*, 51 Division Place, Brooklyn, N. Y. Numerous spray booths of various sizes are illustrated.

According to the bulletin, Aqua-Restor water-wash spray booths were developed to meet high-speed industrial spray painting requirements and offer maximum production with greater labor and fire protection safeguards. Advantages of these booths are said to include unusually high pigment reclamation, low horse power pumping, continuous and completely controlled water curtains which do not shower the worker or product, and minimum losses for servicing because of the complete absence of spray nozzles or moving parts.

Aqua-Restor spray booths are engineered to specification, meeting small and large spraying operation requirements.

Copies of the bulletin and, if desired, more detailed information may be obtained by writing to the Sales Department at the above address.

Charles D. Wettach and *John R. McCune, Jr.*, Pittsburgh industrialists, have been elected to the board of directors of *The Sterling Varnish Company*, Haysville, Pa.

Mr. Wettach is past president of the National Paint, Oil and Varnish Association of the United States, a director of the Pitt National Bank and chairman of the Athletic Committee at the University of Pittsburgh.

Mr. McCune is president of the Consolidated Lamp and Glass Company, Coraopolis, a director of the Union National Bank, and Lockhart Iron and Steel Company.

The Sterling Varnish Company was established in 1894 and developed the first electrical insulating varnish. They have specialized in the manufacture of such materials since then and during the past ten years have also entered the protective paint and technical coating field.

The company operates three manufacturing plants: one at Haysville, Pa.; one at Leetsdale, Pa.; and one at Manchester, England.

Thru World Wars I and II

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New Equipment and Supplies

Infra-Red Ovens

Wil-Son Manufacturing Corp., Dept. 64-OF, 154 West Erie Street, Chicago, Ill., have announced their new Patent-Flex infra-red ovens. These ovens are so constructed that they may be adjusted to form the shape of tunnel required to fit the object being baked or dried. The ovens may be used as single units, in end-to-end assemblies, as vertical banks, double banks, or complete enclosures. The manufacturer states that changes in tunnel shape may be made in three to four minutes. No special tools are required. Other features include heavy-duty construction, dual stands for maximum stability, and the cleaning and relamping of the tunnel while it is in operation.

Standard sections of the Patent-Flex ovens consist of four rows of lamps of four to sixteen lamps per row. Extra lamp rows which may be added to standard units may be obtained. Each section includes sockets, wiring channel, and pipe stand and base, ready for wiring and installation. Wired sections are also available.

Insulating Varnish

A new polymerizing black baking varnish has been developed by John C. Dolph Co., 168 Emmett St., Newark, N. J. This varnish is recommended by the manufacturer for use on all types of plain, bare, synthetic coated, textile and glass covered wire. It is especially recommended for use on stationary and revolving units constructed with Class B insulating materials. In this connection the varnish is said to possess bonding properties which will hold modern types of magnet wire and insulating materials intact under the centrifugal force developed by high speed unit windings.

Known as PX-5 Black Baking Varnish, this material may be applied by dipping or vacuum impregnation. It is baked at 245° to 275° F. for 1½ to 3 hours, depending on the size and dimensions of the unit being varnished. It may also be baked with heat lamp equipment. When thoroughly dry, it is said to be oil proof and highly resistant to abrasives and carbon tracking. Test specimens prepared in accordance with ASTM procedures indicated high wet and dry dielectric strengths and excellent resistance to water, acids and alkali.

Further information may be obtained by writing to the manufacturer, Department 45, at the foregoing address.

Masonry Finish

Colorthru, a finish coat for masonry, is manufactured by Colorthru Chemical Co., Dept. OF, 20 West 45th St., N. Y., N. Y. This material is recommended for concrete, brick, stucco, cement, etc. It is said that no priming is necessary and that it may be applied over painted or unpainted surfaces and to old or new masonry even when wet. Colorthru is ready mixed for use and is applied by brushing or spraying. Coverage is stated to average 400 square feet per gallon.

Paint Deodorant

A concentrated paint odor neutralizer, Ridsmel, is being offered to the finishing industry by Holley Chemical Co., Dept. OF, 122 East 25th St., N Y., N. Y. This deodorant is recommended for paint, varnish and enamel and is said to eliminate all objectionable odors. According to the manufacturer, Ridsmel has saved thousands of working hours in various industries by obviating the necessity of work stoppages during painting. It is used at the rate of one pint to 100 gallons of finishing material. It is not recommended for use in lacquers.

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● A CHEMICAL PHOSPHATE DIP TREATMENT FOR IRON, STEEL, ZINC AND CADMIUM PROVIDING A RUST INHIBITING BASE FOR PAINT OR A FINAL FINISH.
The IRCO-IZING Process has been approved in production because it speeds up production and cuts down rejections.
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Marschke Swing Frame and Pedestal Buffers are made in sizes from 1 to 15 HP, single and selective speeds. Write for Buffer Bulletin #47.

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Shop Problem

Problem 10. Spray Gun Pressures

Problem: A manufacturer of finishing materials recommends to one of his customers that a certain baking enamel be reduced four to one by volume with thinner and sprayed at 60 pounds per square inch air pressure and 5 pounds per square inch fluid pressure. The customer does not have pressure feed spraying equipment but uses gravity feed material buckets which are suspended from the ceiling by pulleys and ropes so that the height of the buckets may be adjusted. How high above the gun must a bucket be suspended in order to approximate the 5 pounds per square inch fluid pressure recommended by the finishing material manufacturer?

Solution: The height to which a gravity feed material container must be raised to equal a given pressure may be obtained from the following equation:

$$H = \frac{(2.306)\ (P)}{(S)}$$

where (H) is the distance in feet from the surface of the finishing material in the container to the spray gun nozzle, (2.306) is a constant, (P) is the pressure in pounds per square inch, and (S) is the specific gravity of the finishing material.

In the problem under consideration it is found that the specific gravity of the finishing material is 1.05. Substituting this value of 1.05 for (S) and the value of 5 for (P) in the equation, it is found that

$$H = \frac{(2.306)\ (5)}{(1.05)} = 11 \text{ ft.}$$

that is, the bucket must be raised to such a height that the distance from the surface of the finishing material in the bucket to the spray gun nozzle is approximately eleven feet.

Patents

Coating Composition

U. S. Pat. 2,317,725. K. Billig (Germany), vested in the Alien Property Custodian, April 27, 1943. A coating composition comprising an aqueous solution of the ammonium salt of an interpolymerization product of about 90 to 98 per cent of vinyl acetate with about 2 to 10 per cent of crotonic acid, which when applied and dried gives a clear, solid, hard, water-proof film, insoluble in water and resistant to benzine and mineral oils.

Coating Composition

U. S. Pat. 2,317,371. A. E. Gessler and D. M. Gans, assignors to Interchemical Corp., April 27, 1943. A composition comprising copper phthalocyanine dispersed in a liquid comprising a heat-convertible synthetic resin soluble in aromatic hydrocarbons and insoluble in saturated aliphatic hydrocarbons, dissolved in a volatile liquid pine terpene, the composition being substantially free of aromatic hydrocarbons and of unsaturated aliphatic hydrocarbons.

Drying Oils

U. S. Pat. 2,317,361. I. M. Colbeth, assignor to The Baker Castor Oil Co., April 27, 1943. A liquid oily castor oil product having drying properties and containing chemically combined boron.

The process which comprises treating castor oil with a boron compound by heating it slowly up to a temperature of about 260°C. to form a boron compound and then decomposing said compound by rapidly heating it to about 300°C.

Varnish Oil

U. S. Pat. 2,318,009. I. J. Novak, assignor to Raybestos-Manhattan, Inc., May 4, 1943. A process for producing a relatively pale, amber colored, heat bodied, air blown varnish oil further characterized by being quick drying, of high waterproofness, tough film formation, good adherability to metals, and suitable for use in the formulation of pale varnishes and white enamels, which comprises subjecting a drying oil of the non-conjugated type to filtration through absorptive earth, prior to or without appreciable chemical treatment thereof, to reduce its ash content to about .01% to .001% by weight thereof, thereafter subjecting it to controlled low temperature air blowing to form an oil of conjugated system fluid at 25°C., and heating said conjugated oil at a temperature of from about 500°F. to about 600°F., to form a varnish oil of desired finished viscosity.

As a new product, an oil of the China-wood oil type comprising a blown drying oil of the linseed oil type, said blown oil being insoluble in alcohol and soluble in petroleum solvents having an ash content of less than .01% and characterized by substantial absence of frothing and development of red color on heating above 250°F.

● Shot, shell, bombs or hand grenades can be sprayed with Permite Government Specification Ammunition Lacquers **immediately** after they come out of the hot alkali bath. No time lost for drying and cooling. Permite Ammunition Lacquers do not crack or blister when applied to the hot surfaces.

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Permite Ready-Mixed Aluminum Paints have gone to war. But they will be available for the greatly expanded uses which the return of peace will bring.

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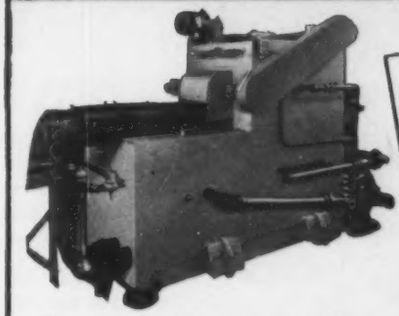
AUTOMATIC METAL CLEANING EQUIPMENT



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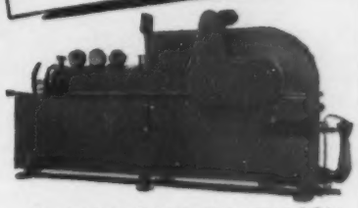

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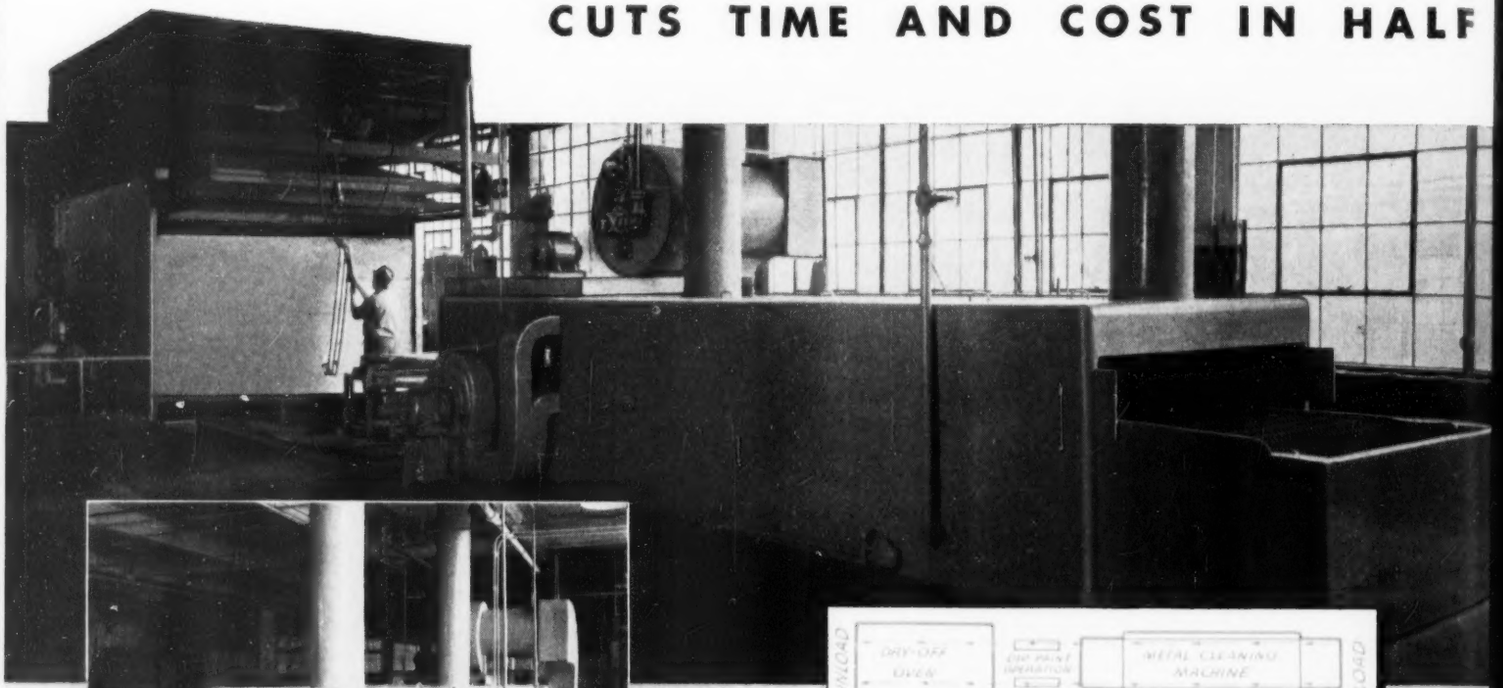

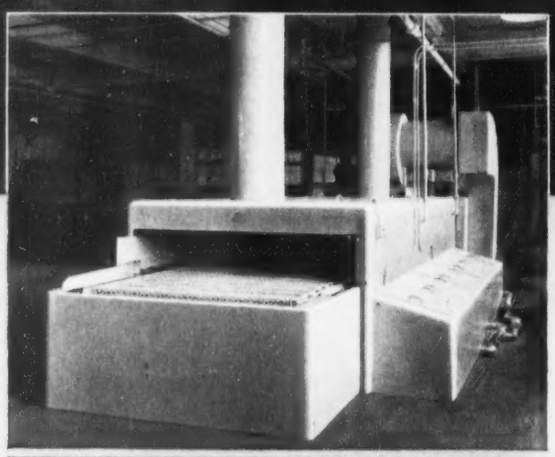

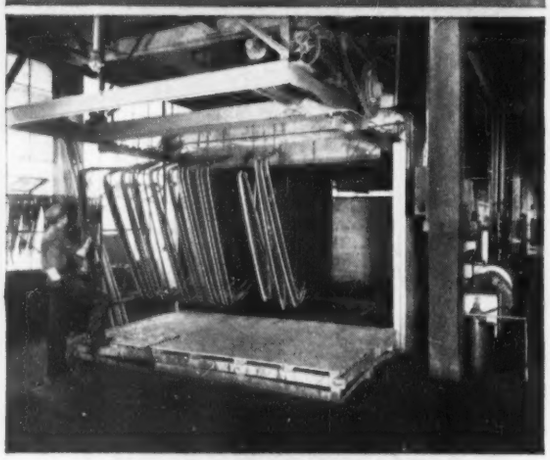

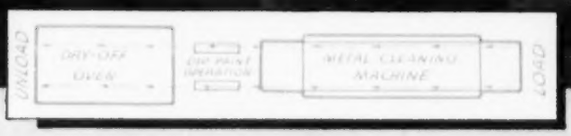

TOP: Complete installation. Showing straight line production.
CENTER: Cleaning Machine, with apron-type conveyor, accommodates 3 products, each a different size and shape.
BOTTOM: Unloading oven. Overhead conveyor, heating equipment, safety devices and controls all entirely automatic.

● The unprecedented demands of war have taxed the resources of the Mahon organization to the utmost to design, build and install—*in record time*—equipment that would handle efficiently and economically enormous production schedules. But saving time and money is just as vital to those manufacturers whose production is of a more moderate size. In scores of such cases, Mahon engineers have cooperated to the fullest possible extent. The installation of finishing equipment, pictured here, is a typical example. This company, The Motor State Products Company, Ypsilanti, Michigan, manufactures three essential products, each a different size and shape. Their problem was the procuring of finishing equipment that would effectively handle all three. Cooperating with the company's engineering staff, Mahon engineers developed and installed a specially-designed metal cleaning machine and a dry-off oven, with handling equipment for a dip painting process located between. In this installation three important things stand out. Initial expense was gratifyingly small. Production time and cost was cut better than half. Only four men now are required to handle all finishing operations.

If a finishing problem exists in your plant—no matter whether your operation is large or small—Mahon engineers will be glad to work with you in planning speedier and more economical production. There is no charge for consultation.

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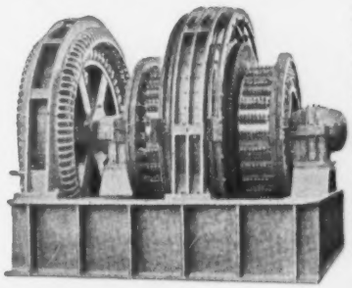

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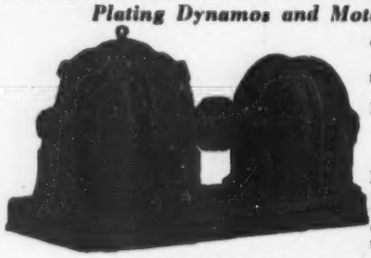

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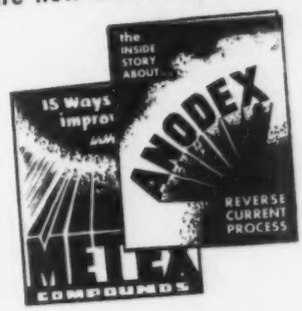

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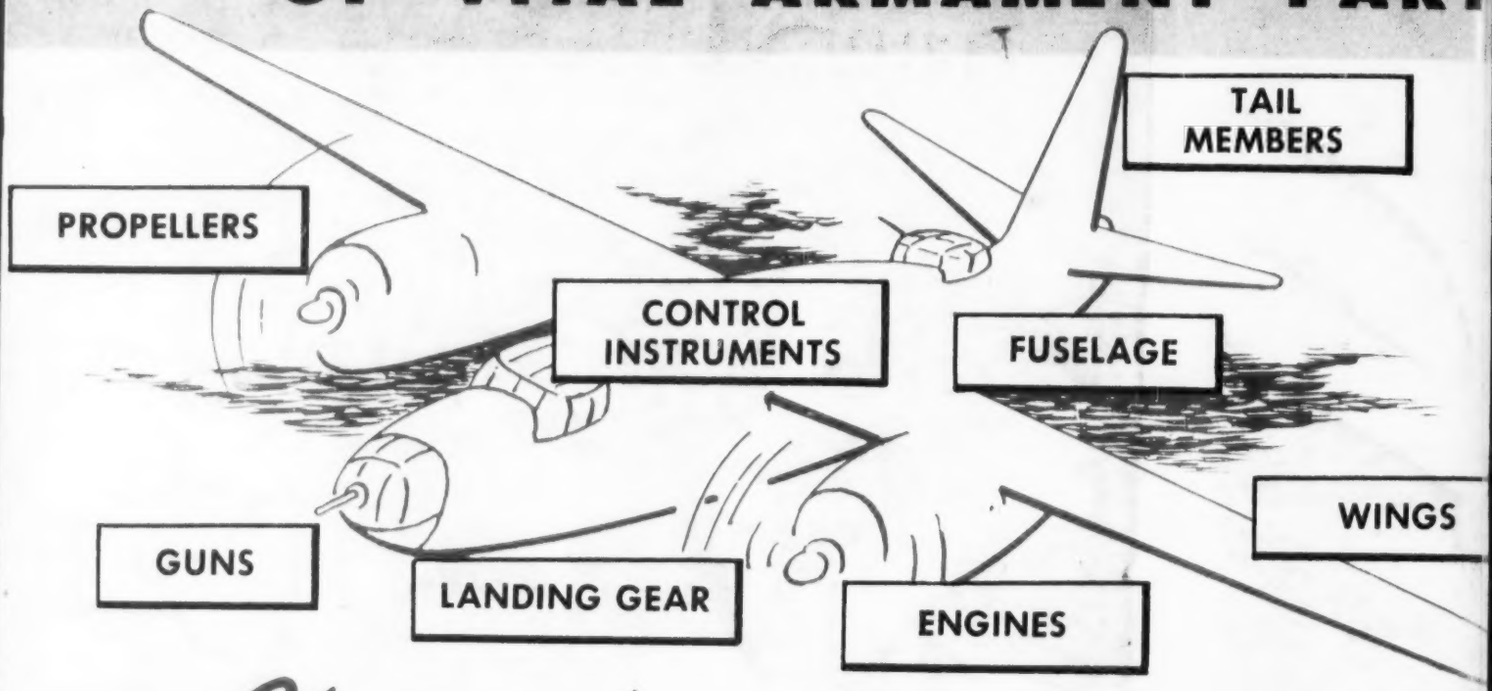

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